VISUAL IMPAIRMENT LEARNING & VOCATIONAL SCHOOL

SENG KHAM PHYU

A THESIS SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

BACHELOR OF ARCHITECTURE

DEPARTMENT OF INTERIOR ARCHITECTURE
SCHOOL OF ARCHITECTURE AND DESIGN
ASSUMPTION UNIVERSITY

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Thesis Approved:

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VISUAL IMPAIRMENT LEARNING & VOCATIONAL SCHOOL

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The object of this project is to provide a school that provides not only the required education but also the necessary skilled and communication to the children who are visual affected in the life. This school is to give the learning through other senses such as touch, hearing, smell, taste and movement to both children, who are visually impaired, but all is not lost and to those who have lost the vision.

Being a disability does not mean that a person have to give up on his life, there are many evidences and proves that point out that they can be a part of the society, and so these children can participate in school, sports and extracurricular activities, contribute to the community, go to college, and accomplish just about anything as average people. Therefore, there will programs that will give skill and knowledge that can grant the career that will increase the quality of life of these children.

In this project there will be a friendly and hospitable environment that can eliminate the barrier between these children and the outside world, by guiding them with the communication technique and also activities that can create the connection between the visually impairment children and public.

Most of the children and their families have to face anxiety and depression due to the blindness and visual impairment, therefore, this project will provide the consultation and activities to give advises to reduce these facts.

As a conclusion, the project is to identify both physical and mental needs of the children and to accomplish them which will prepare for the adulthood of the children.

Acknowledgements

This Project has been a memorable journal to my university life and I would like to express the deepest appreciation to the support of several important and special people who helped me to complete this project.

First of all, I would like to express my sincere gratitude to my advisor, Ajarn Vatcharat Samakkamai, for giving me all the comments, advices, direction and times. This project will not complete without his guidance. I have got a lot of knowledge and also learnt a lot during this project from him. I am very grateful for having him as my advisor throughout this whole year.

Moreover, I would also like to thanks to all the Ajans for all the advices, encouragement and hard work to all of us to get to finish the project.

I would like to thanks to my family for always supporting me, especially my father and aunt for taking care of me and giving me a chance to study and get the bachelor degree.

Lastly, I would like to thank all my friends who help me during the project by finding the site and other requirements all the time.

Seng Kham Phyu

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Chapter 1: Thesis Introduction

Chapter 1: Thesis Introduction

1.1 Project Background

Our senses are connected to the environment. The brain receives information from our eyes, nose, ears, tongue and touch from the skin and transform into memory and feeling. Losing even one of these senses create conflict and difficulty in the daily activity. Humans have five senses: eyes, ears, nose, tongue and skin. Among them, the eyes are the most essential organs. The eyes, the sight, deliver 80% of all the impressions which protect as from dangers.

According to the research, Southeast Asia has a large portion of visual impairment over the globe (Pie Chart 1.1.1) 1998 Gallup Poll[1], 42% of the adult listed blindness as the most fears disability. Moreover, the percentages of the visual impairment children are increasing over the year[2] (Bar Chart 1.1.1).

Nowadays, the number of educational center are rising up according to the life style which provide the parents in many ways, however, very few of these provide function for disable children (visual impairment children). Therefore, this school is for children with visual disable and who cannot receive a formal education and enter society because of their status, and are not accepted by the regular schools for handicapped children. As these children have nowhere to go, this program is for every child has the right to receive education.

The purpose is to provide the safe and comfortable especially to the visual impaired children with the required activities to improve their education, growing process and ability to live and social.

This program is to serve children who suffered from visual impairment from the age

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[1] Members of the Visual Impairment Scotland Team, "Visual Impairment Scotland Report," SSC (Scottish Sensory Centre), accessed May 10, 2016, http://www.ssc.education.ed.ac.uk/viscot/ch11.html.

[2] US Department of Health; The World Health Organization, "Magnitude and causes of visual impairment, Health Topic A to Z," Allcountries.org, accessed May 10, 2016, http://www.allcountries.org/health/magnitude_and_causes_of_visual_impairment.html.

of 12-18 which is divided into;

- Blindness – ranges from being totally without sight to unreliable vision and primary reliance on other senses.
- Low Vision – is reduced central acuity of 20/70 or less in the better eye after correction. In most of the case, student can see the contrast colors, however, should avoid visual distractions around an object.

The Project is a learning and vocational training school. In the program, there are not only educational but also other factors such as communicating which can let the children to fit into the society, methods of mobility for to travel without helps and learning for career and skill for future. Besides, as it is a center there will be events and activity that can create students to participate with other people.

1.2 Study Defined

1.2.1 Reasons of study

- Besides, supporting system for Learning Process to get a proper education through the special technique such as ***Braille*** which are a tactile writing system and other technical methods to help in the learning process.

- The requirements to continue the adulthood such as in communicating firstly with family, friends and to the society. Moreover, improve in communicating with other people and participate in society.

- Learning the mobility with the help of technology and other access to improve daily travel.

1.2.2 Objectives of study

- To acknowledge and supervise in the career path according to the life style that is suitable for the children and what they desire to have in their adulthood.

- To understand and provide the required education system to the visual impairment children in general subjects (Mathematics, Art, Science and Languages) and developed the other senses.

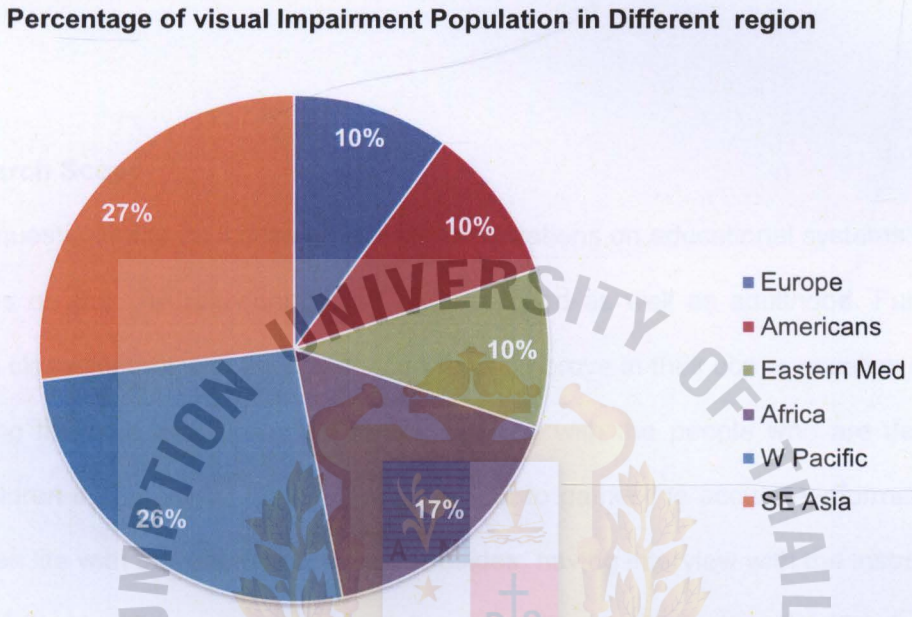

FIGURE 1.1.1 GLOBAL ESTIMATE OF VISUAL IMPAIRMENT BY ITS REGION

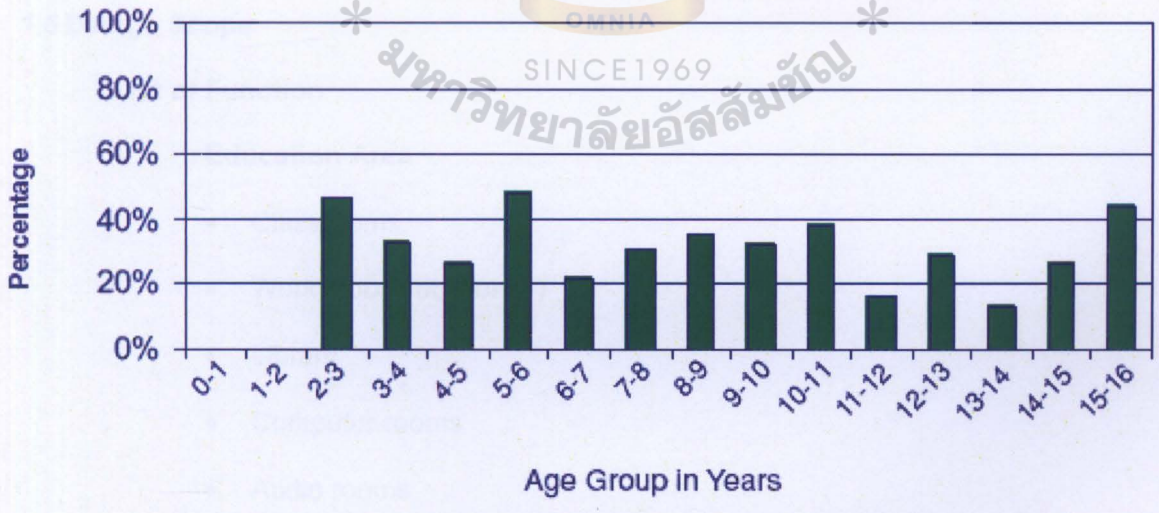

FiGURE 1.1.2 BLIND REGISTRATION STATUS BY AGE

1.3 Thesis Statement:

The aims of this study are to create a school that acknowledge and improve the requirement form daily activity starting from education, career, physical needs and communication for their adulthood. Moreover, this project is to create an educational place that helps to eliminate the barriers as much as possible to enhance the differences in their society.

1.4 Research Scope

The questions rise as it asks how these preparations on educational systems can make differences on the children during their children hood as well as adulthood. Furthermore, being in a close contact with the society can really improve in their communication skills.

During the research, there will be interviewing with the people who are dealing with actual children in the similar state with the subject to gather the accurate information about the children life with the visual impairment. Besides, having interview with the instructors and parents of these children to understand the difficulties and how they handle them at the same time.

1.5 Design Scope

List of Function

Education Area

- Classrooms
- Workshop(Vocational)
- Library
- Computer rooms
- Audio rooms

Activity Area

- Seminar rooms
- Training rooms
- Multifunction area (Events, Activities, etc.)
- Consulting area(Parents)
- Canteen

Office

- Administration office
- Employment office
- Staff area

Outdoor Activity Area

- Sport area
- Playground
- Event area

1.6 Definition of Terms

1. Blindness – state or condition of being blind, literally or figuratively.[3]

2. Low Vision –is a vision that cannot be correct even after treatment or surgery or with regular eyeglasses.

3. Braille is a tactile writing system used by people who are blind and low vision. It is traditionally written with embossed paper. Braille-users can read computer screens and other electronic supports thanks to refreshable braille displays[4].

[3] "blindness," Definitions.net, accessed May 10, 2016, http://www.definitions.net/definition/blindness. (no author)
[4] "braille," Definitions.net, accessed May 10, 2016, http://www.definitions.net/definition/braille. (no author)

Chapter 2: Project Type Researches

Chapter 2: Thesis Introduction

2.1 Literature Searches

2.1.1 What is Visual Impairment?

Visual impairment (VI) refers to a significant functional loss of vision that cannot be corrected by medication, surgical operation, or ordinary optical lenses such as spectacles. *(Based on WHO definition)*

Visual impairment including blindness means impairment in vision that, even with correction, adversely affects a child's educational performance. The term includes both partial sight and blindness. Visual impairment includes two main categories:

- Blindness
- Low vision

TABLE 2.1.1 CLASSIFICATION OF VISUAL IMPAIRMENT

Category	Corrected VA better Eye	WHO definition	Working	Indian definition
0	6/6 - 6/18	Normal	Normal	Normal
1	< 6/18 - 6/60	Visual Impairment	Low Vision	Low Vision
2	< 6/60 - 3/60	Severe Visual Impairment	Low Vision	Blind
3	< 3/60 – 1/60	Blind	Low Vision	Blind
4	< 1/60 - PL	Blind	Low Vision	Blind
5	No PL	Blind	Total Blindness	Total Blindness

Low Vision (Standard Definition (WHO 1992))

VF loss of <100 from point of fixation but who uses, or is potentially able to use, vision for the planning/execution of task.

Blindness (Vision 2020 - World Health Organization)

Visual acuity of less than < 20, or a corresponding visual field loss to less than 10°, in the better eye with the best possible correction.

Global burden of visual impairment (WHO 2001)

World wide World wide (children)

- Low vision : 7 million
- Blind : 1.5 million

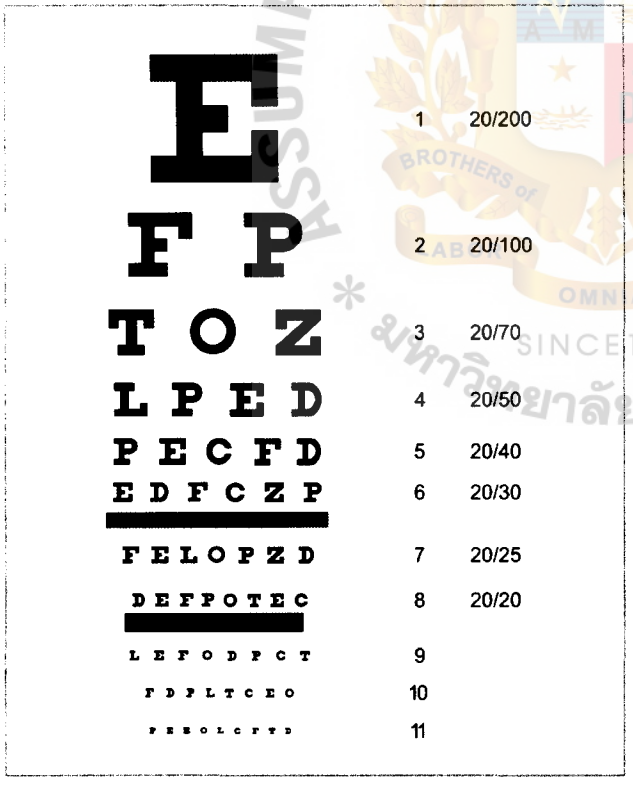

FIGURE 2.1.1 SNELLEN CHART

2.1.2 Functional effect of Low Vision

Loss of central vision *(e.g. macular degeneration, toxoplasma scar)*

- Difficulty reading
- Problems writing/ completing paperwork
- Inability to recognize distance objects and faces

Loss of peripheral vision (*e.g. Retinitis pigmentosa, glaucoma etc.)*

- Difficulty in mobility and navigation
- Difficulty reading if there is constricted central visual field
- Visual acuity may not be affected until very advanced disease

Cloudy media *(e.g. Corneal scar, vitreous hemorrhage etc.)*

- Blurred vision
- Reduced contrast
- Problems with glare

Causes of the eyes to function efficiently may be traced to;

- Errors of Refraction
- Imbalance of the Eye Muscles
- Diseases
- Trauma or Accidents

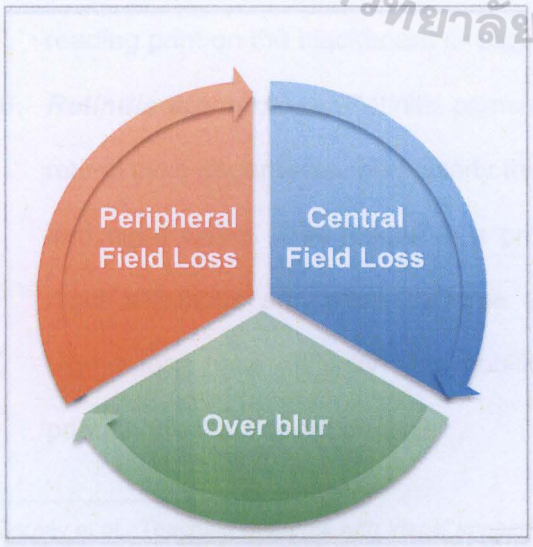

FIGURE 2.1.2 FUNCTIONAL EFFECT OF LOW *Vision*

Common Eye Conditions

Following are the most common eye conditions;[5]

1. **Albinism:** Albinism is a genetic condition in which there is a lack of normal pigment in the eyes and often in the skin and hair. Students with albinism usually have reduced visual acuity, sensitivity to light and nystagmus.
2. ***Amblyopia:*** Amblyopia is referred to as a lazy eye. There is reduced visual functioning in one eye that causes the student to use only one eye instead of both.
3. ***Retinal detachment:*** A retinal detachment occurs when parts of the retina pull away from the supporting structure of the eye and atrophy occurs. The retina may be reattached if little time has transpired.
4. ***Glaucoma:*** Glaucoma is a disease in which there is damage to the optic nerve, through increased pressure from the fluid within the eye, resulting in reduced visual acuity and loss of peripheral vision. The fluid pressure is monitored regularly by an ophthalmologist. Students with glaucoma generally have difficulty with mobility and focusing their gaze between near and distant objects.
5. ***Macular degeneration:*** Macular degeneration is an eye disease which results in gradual loss of central vision. Students with macular degeneration have difficulty reading print on the blackboard or page.
6. ***Retinitis pigmentosa:*** Retinitis pigmentosa is a hereditary condition in which the retinal cells degenerate, particularly the rods which are responsible for peripheral and night vision. This results in a progressive narrowing of the field of vision, night blindness and often extreme sensitivity to light. Students with retinitis pigmentosa have difficulty with mobility, scanning the environment and reading print on the blackboard or page.

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[4] Susan Carney et al., *Teaching Students with Visual Impairments: A Guide for Supporting Team (Regina:Saskatchewan Learning, n.d.),4-5,*
http://www.sasked.gov.sk.ca/k/pecs/se/publications.html.

2.1.3 Supporting system and technology

Braille

Braille – primary means of literacy for a blind person. It is a system of writing and reading in which letters, words, numbers and others are made from raised and embossed dots. It was invented 1830's by Loiuse Braille, a young blind man Frenchman who played organ in church and use it to record church hymns and music.[6]

It is a complex system. It is the specific placement of six raised dots that are numbered. Various arrangements of the dots make up 63 combinations, which are called cells and represent numerals, letters of the alphabet and word contractions. Braille is produced on a Perkins Braillewriter or electronic braillewriter.

Teaching Resources: Learning materials in braille or tactile format should be provided for a student who requires embossed materials. A felt pad is placed underneath the braille when it is being used, to reduce noise.

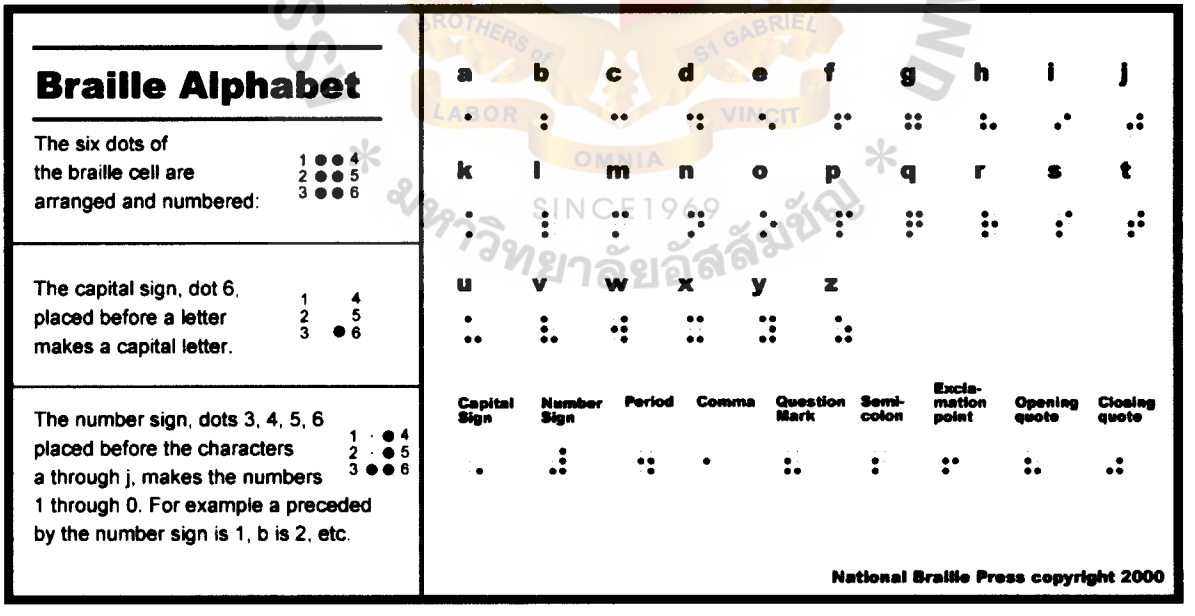


FIGURE 2.1.3 GENERAL BRAILLE ALPHABET

[6] Barbara Pierce, ed., "The World Under My Fingers: Personal Reflections on Braille" *Future Reflections Winter 1996, vol. 15,* No.1(December,1996), 13, https://nfb.org/images/nfb/publications/fr/fr15/issue1/f150113.html.

2.1.3.1 Rehabilitative Devices for Visual Impairment

There are various kinds of devices and equipment that can let students to improve their residual visual performance & helps to attain functional vision for the particular task of concern. *(Teaching Students with Visual Impairments: A Guide for Supporting Team)*

- Optical
- Electronic
- Assistive Devices

General equipment and devices to;

- Optical: Magnification
- Screen Reader/Speech Synthesizer
- Voice Access
- Scanner
- Optical Character Recognition Software
- Electronic Braillewriters
- Print-to-Braille Software
- Cassette Recorder
- Low Tech Adaptations
- Screen Enlarger
- Screen Reader/Speech Synthesizer
- Voice Access

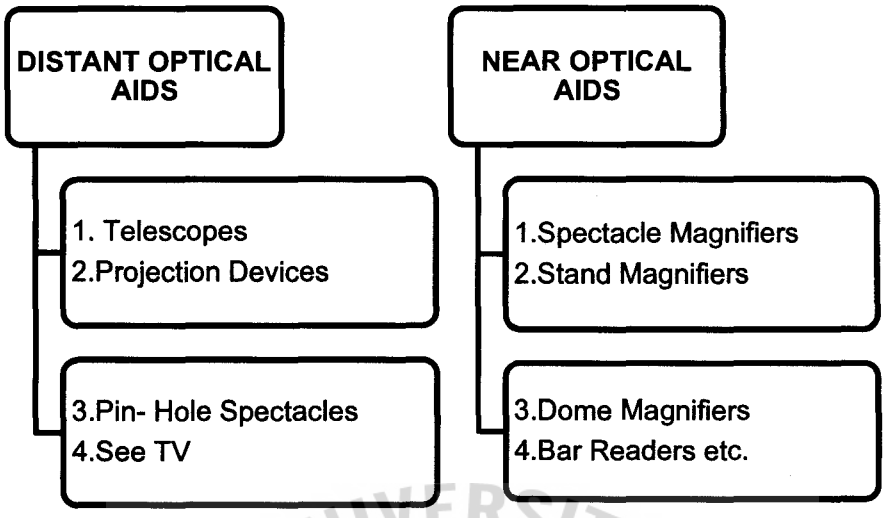


FIGURE 2.1.4 TYPE OF OPTICAL AIDS

2.1.3.2 Sensory Motor Skill

Other senses apart from vision are a supporting system for orientation and navigation for visual impaired people. A visually impaired person does not automatically have a better ability in other senses (touch, hearing, smell, or taste); they have to train to use them as well as possible[7].

- Touch
- Hearing
- Smell and Taste
- Residual Vision

Touch

It is a primary sense for visually impaired people to gets concrete and exact knowledge of the world around them. By feeling and touching objects with texture, shape, size, weight, hardness, surface qualities, and temperatures allow them to explore the surrounding space and things. It is also much effected to gather information in public and crowded place.

- Grasping and holding objects
- Transferring objects from one hind to the other
- Exploring objects
- Moving Fingers

[7] J. Kirk Horton and Hellen Keller International, *Education of Visually Impaired Pupils in Ordinary School, no.*6 of *Guides for Special Education* , (Paris: UNESCO, 1988), 23, http://unesdoc.unesco.org/images/0008/000828/082892eo.pdf.

Hearing

The sense of hearing is one of the primary senses for a visually impaired people to gather much information by listening. As for young children, It can help them to follow classroom activities and obtain information from the teacher's presentation and classroom discussions.

Smell and Taste

The sense of smell and taste serve as secondary sensory to the visually impaired people. Smell and taste can provide useful information surroundings the users. The sense of smell can help to keep orientation and navigation.

For smells the visual impaired children have to develop the ability to:

- Be aware of smells.
- Identify and discriminate smells.
- Tell the location of the smell.

For taste the visual impaired children have to be able to:

- Be aware of different kinds of taste.
- Identify foods by the taste.

Residual Vision

Especially for low vision, training the Residual vision is very essential as it can support them in many different ways in their daily activity. A person with remaining vision should be courage to how to use them and train them effectively. It will be much easier to operate activity rather than not have sight.

2.2 Design Theory and Principle

2.2.1 Psychology and Psychosocial of Implication of visual impairment

- Information gather from the article about an interview of An Expert Interview With Khadija S. Shahid[8]

1. **Psychological and Psychosocial problems of person with loss of vision**

Khadija S. Shahid stated that loss of vision not only presents difficult physiologic challenges, it can also exact significant psychosocial costs.

One of the most common psychological comorbidity of vision loss is *'Depression'*. According to the Preventing Depression in Age-Related Macular Degeneration (AMD) trial, 30% of patients with AMD will experience depression.

It is also a common thing for patients to report fear and anxiety related to the anticipation of future vision loss or blindness and phobic anxieties, such as *fear of open spaces, traveling in crowded areas, and being left alone.*

People who have *Glaucoma* or *Diabetic Retinopathy* suffer nonspecific complaints of eye pain which may lead "*the psychosocial stress*" of vision loss.

2. **Quality-of-life issues associated with visual impairment**

Vision loss or blindness in children always raises concerns about social, emotional, and educational growth and development, especially in the building of relationships with family, friends, and society.

It is unreasonable to have lower expectations of a child's scholastic achievement, and they should not be leave alone by themselves. Providing the right kinds of support with good interventions, can ensure that a child's education is not limited by impaired vision (Khadija S. Shahid,, 2012).

[8] Khadija S. Shahid, interviewed by Steven Fox, *Visual Impairment: Understanding the Psychosocial Impact,* Medscape Medical News, October 29, 2012.

3. Effectiveness of Rehabilitation on Visual Impairment

Khadija S. Shahid also stated that Rehabilitation of visual impairment helps to optimize visual function i.e., the ability to conduct day-to-day activities independent of visual acuity.

In addition, it's crucial to recognize and refer those in need of psychotherapy. That is important for individuals and members of their families who provide physical and emotional support, which can help them take a proactive approach to self-rehabilitation, and helping them achieve a sense of control over their lives.

Moreover, rehabilitation helps them to control how to accept and adapt into changes which involves a realistic understanding of what the limitations created by vision loss and what remaining capabilities exist to maintain a balance between independence and assistance.

4. Theory and other alternatives method to help psychology concern of visual impairment

Therapy can be effective in addressing specific psychological diagnoses and are necessary to manage the symptoms of these diseases. However, the patient must be incorporated with the management strategies outlined above to address the root cause of these comorbidities.

Meditation also helps to control anxiety and depression in visually impaired individuals. Examples of such approaches are Relaxation and meditation techniques, hypnosis, yoga, and breathing exercises are also effective in controlling emotion (Khadija S. Shahid, 2012).

5. Psychosocial adjustment, self-concept identity & self-esteem in children with visual impairment

Khadija S. Shahid suggested that the adjustment to life in a world that is essentially visual is a complex feat. Adjustment is inevitably tied in with issues of independence, sufficiency and control and will vary from person to person influenced by their character, previous experiences and support network. Research on psychosocial adjustment has incorporated a variety of questions ranging from the impact of progressive or immediate visual loss, anxiety, the inability to work, avoidance and bullying to the role of support networks such as friends, families and charities. Several studies on the psychosocial adjustment of children with low-vision show that children with low-vision tend to be more unsettled by the limits of their vision, when compared to those whose handicaps are more severe.

In addition parents of children with low-vision seem to be less understanding of the disability than those of blind children. Children with low-vision tend to exhibit with more frequency underachieving behaviors and fatigue and are more prone to emotional problems.

It is an important aspect in psychosocial adjustment is the development of a positive self-concept which defined as a set of attitudes individuals hold about themselves that help shape their identity, self-image, and esteem. Self-concept is what conditions are expected and motivated the behavior and it has important implications on the personal, professional and social lives. A positive self-concept is usually associated with the ability to cope and overcome the consequences of a disability. It gives an individual a positive outlook on life, satisfaction and commitment. Negative self-concepts are usually associated with isolation, depression and mental and health problems.[9]

[9] Victor Roger Schinazi, "Psychosocial implications of blindness and low-vision," *UCL Working paper series Paper 114* (February, 2007): 4, https://www.bartlett.ucl.ac.uk/casa/pdf/paper114.pdf.

2.2.2 Factors that can help visual impairment in daily activity

Designing the space with principle of inclusive design is quite important for people with visual impairment. Not all the design space for people with sight loss is significantly different from designing for people with normal sight.

The design characteristics are not obviously different but it must fulfill the requirement of people with sight loss. Jacqui stated that *"Good design and improved lighting will benefit everyone"*[10].

The main design principles for visual impairment are[11];

- Function & Purposes
- Layout
- Lighting
- Color & Contract

Function and purpose

The function and the purpose of must be focus on the user (visual impairment) to make sure that not only their emotion but also physical.

Mainly focus on the various requirement s of user the space need to be flexibility to serve for individual to adapt to their specific condition and needs.

[10] Jacqui Smith, *Homes and living spaces for people with sight loss: A guide for interior designers* (London: Thomas Pocklington Trust, 2014), 4.
[11] Ibid ., 4-11.

Layout

Furniture and equipment must lay out logically with enough space to walk around them. Furniture and other assistive equipment should be store in an easy access place without cluttering the space. The layout of space/ room should be repeated for easier memorizing for users. The same method is preferable in applying fixtures such as light switches, sockets, taps, doors and window handles.

Lighting

As for visual impaired people, they require more light than normal sight people in operating their daily activities. One of the most important facts is to avoid glare which makes it harder to see and causes discomfort to the user. Moreover, natural light is the most favorable for visual impairment as it is free of glare and easier to control amount of light by using vertical blind.

Color and Contrast

Using contrasted colors in different kinds of surfaces can provide a better attention to people with low vision. The contrast color is attained by a various light reflectance value (LRV).

- Floor finish to skirting board
- Skirting board to wall
- Wall to door frame
- Wall to handrail and light switch
- Door frame to door
- Door to door handle and/or lock

These areas are more common surface and fixture to apply the color contrast to give distinguishing appearances to the low vision.

Contrast

In choosing products and material for LRV (light reflectance value) with a minimum of 30 points difference is required for adjacent surfaces. (The Equality Act 2010)

Color & Contrast in Classroom

In the classroom by using maximum contrast to provide more information to student. Using a different contrast between an object and its background makes the object more visible to the student such as black and white or black and yellow. For glare problems, using intense blue, green or purple on a buff or light yellow background can help to give contrast.

Color paper can provide a better contrast to get more attention from students with low vision. Complex patterns can cause confusion while as bold and sharp print pattern are good for contrast.

Career Choice for Visual Impairment[12]

TABLE 2.2.1 CAREER TYPES

Career Type	Required Skill or Training
Computer Programmer Personnel - Staffing	Computer Skill
Counselor: Adolescent, Business, Pharmacist	
College, Vocational Radio Reading Services	
Disability Service Coordinator Research Analyst	
Dispatcher	
Fine Artists	Art and Craft
Craft Artists	
Designer	
Musicians	Music and Instrument

[12] The Foundation Fighting Blindness, *Career Information for the Blind and Visually Impaired* (Toronto: The Foundation Fighting Blindness, 2000), 22-23, http://www.blindness.org/pdf/careerbook.pdf.

2.3 Case Studies

2.3.1 Primary Case Study

Name: Pattaya Redemptorist School for the blind

Location: Soi 16 Pattaya-Naklua Road, Chonburi 20150

Site Area: 6700 sq.m.

Project Type: Primary, Secondary, High School & Vocational Training

FIGURE 2.3.1 PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

Project Background:

The Pattaya Redemptorist School for the blind serves for both blind and low vision students by providing education, rehabilitation and vocational training to visual impairment student.

Objectives of study:

- To study how do visual impaired student study due to the disadvantage
- To study function and facility in the school
- To study the program of the vocational training

Function and facility

There are two separated buildings which serves a different program.

Building A: General Educational School (Primary, Secondary and High School)

Educational Area

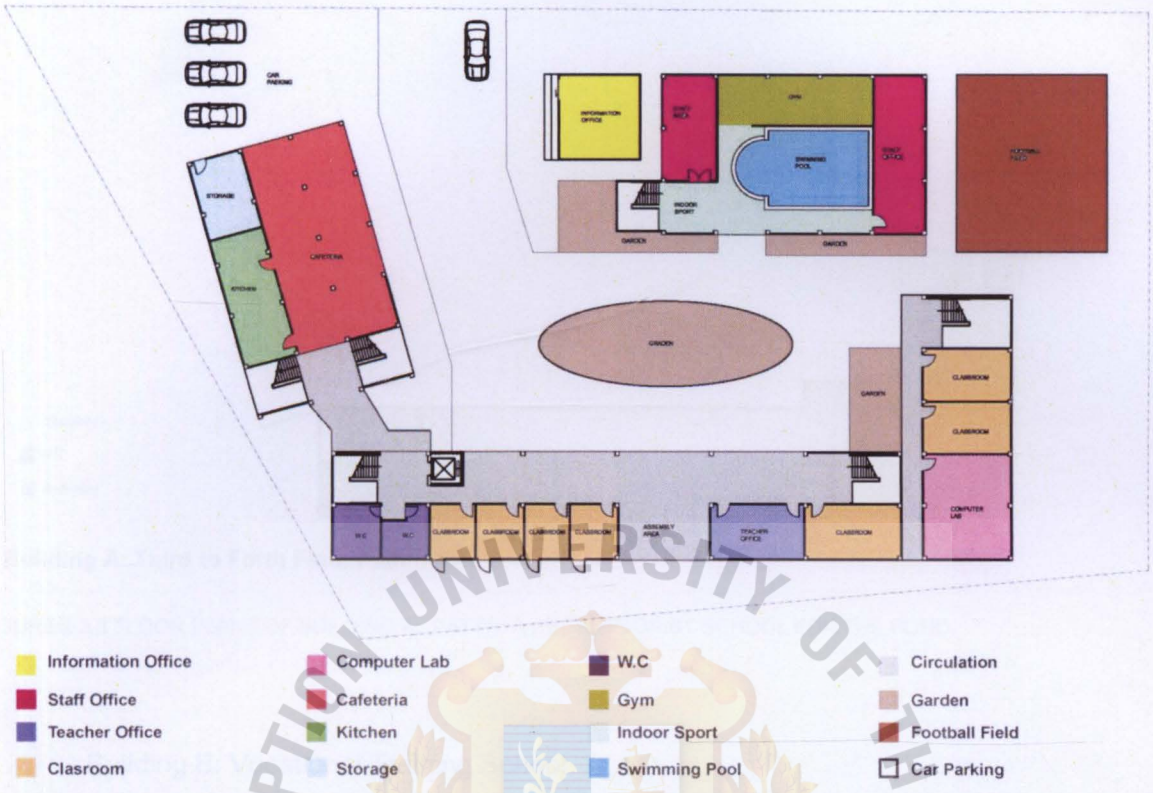
- Classrooms
- Computer lab
- Library

Offices

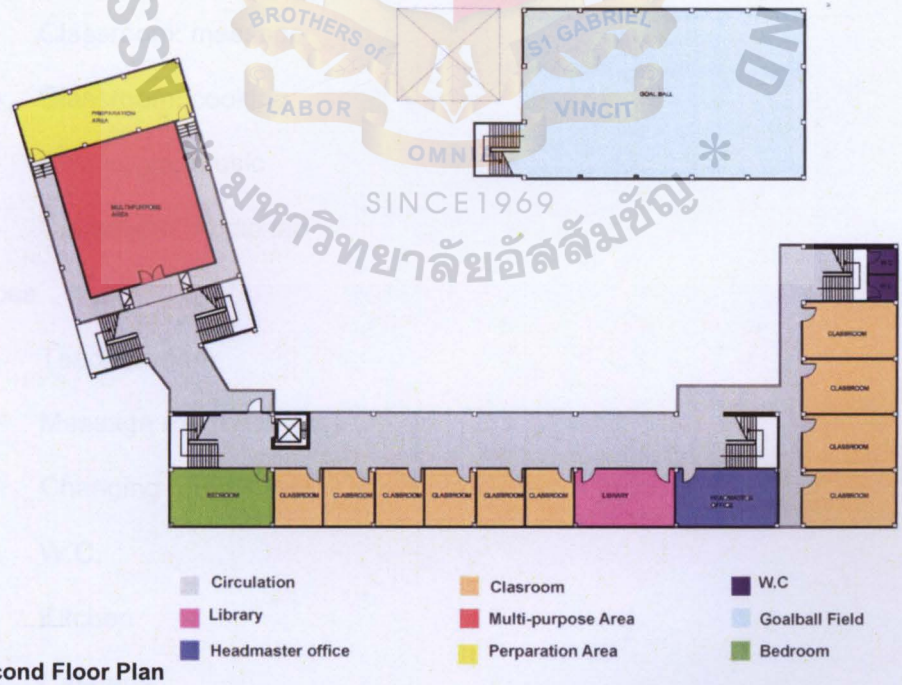
- Staff Office
- Teacher office
- Information office

Other Area

- Multi-purposes area
- Preparation area
- Cafeteria
- Bedroom
- Kitchen
- Gym
- Swimming pool
- Indoor sport area
- Goal ball filed
- Football field
- Assembly area
- W.C.

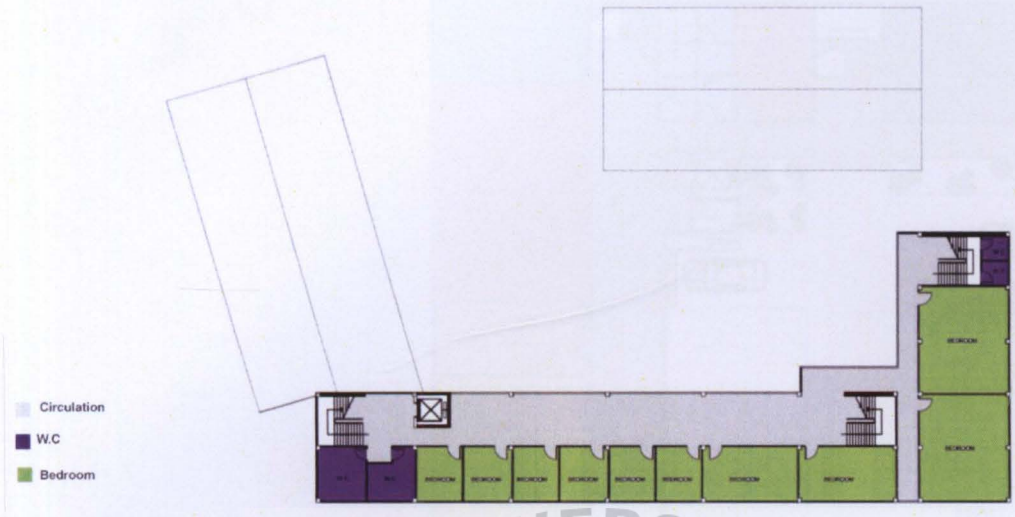


Building A: First Floor Plan



Building A: Second Floor Plan

FIGURE 2.3.2 FLOOR PLANS OF BUILDING A: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND



Building A: Third to Forth Floor Plan

FIGURE 2.3.3 FLOOR PLANS OF BUILDING A: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

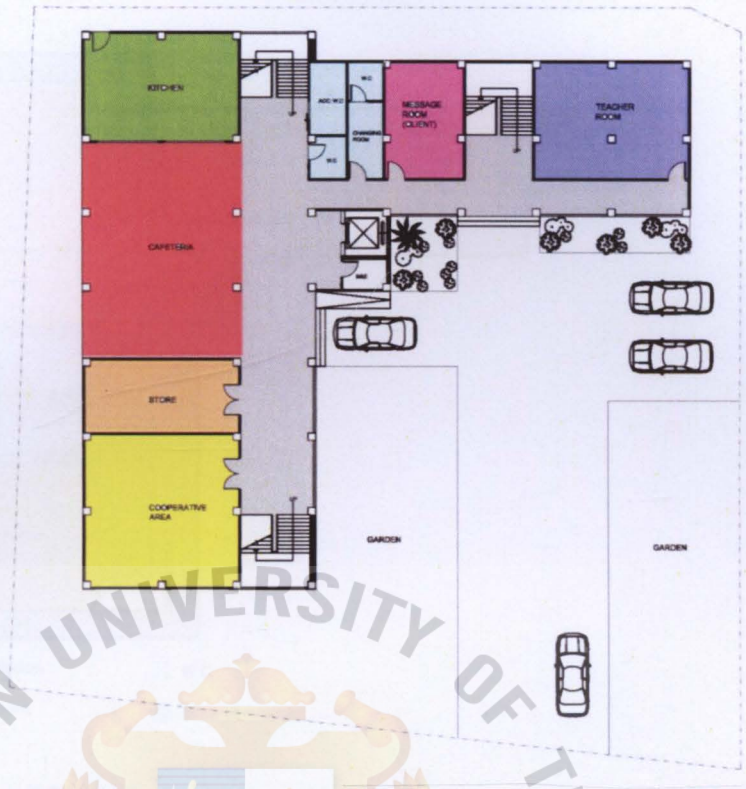
Building B: Vocational Training School

Educational Area

- General Classrooms
- Classroom: massage
- Classroom: cooking
- Classroom: music
- Classroom: Audio lab

Offices

- Teacher room
- Massage room (Clients)
- Changing room
- W.C.
- Kitchen
- Cafeteria
- Store



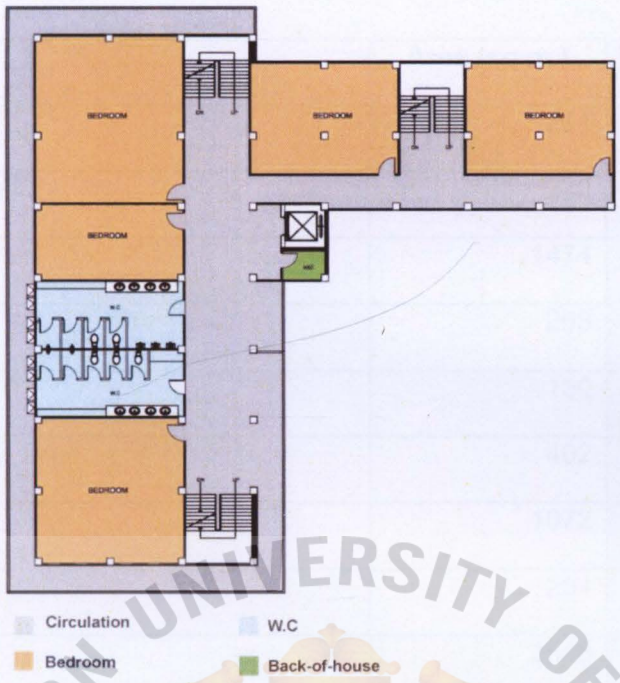
Circulation
Message Room(Client)
Teacher Room
Store
Multi-Purposes Area
W.C
Cafeteria
Kitchen

Building B: First Floor Plan

Circulation
Classroom
Classroom(Cooking)
Computer Audio Lab
Classroom(Message)
W.C
Classroom(Music)
Back-of-house

Building B: Second & Third Floor Plan

FIGURE 2.3.4 FLOOR PLANS OF BUILDING B: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND



Building B: Forth to Sixth Floor Plan

FIGURE 2.3.5 FLOOR PLANS OF BUILDING B: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

Programs

- Curriculum same as public schools (Kindergarten to 12 Grade)
- Thai-English braille and typing
- Daily living skills
- Music
- Sport
- Vocational teaching and training;
    - The use of computers
    - English-Thai typewriters of an advanced level
    - Cooking
    - Handcraft
    - Message
    - Music

TABLE 2.3.1 PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND: PERCENTAGES OF FUNCTION

No.	Function	Area (sq.m.)	Percentages (%)
1.	Lobby	201	3
2.	Multi-purposes	272	4
3.	Classrooms	1474	22
4.	Staff area	268	4
5.	Cafeteria	130	2
6.	Sport/ Activity area	402	6
7.	Bedrooms	1072	16
8.	W.C	201	3
9.	Circulation	2546	38

From the analysis of the area of each function, circulation is one of the largest areas in the whole school. The reason is that there are 350 cm width in most of the circulation and routes to allow at least 2-3 students with cane or guided person to walk along with them. As it is a school, the percentage of classroom is second largest in the building.

Specific design for the target user

1. Safety:

- All the semi-outdoor walkway are covered with metal fences to protect students from danger as well as in the openings.
- At each landing of the stair are covered by steel fence doors that opened only in the daytime and school time to provide security to the students as there are bedrooms in the upper floors. Also these doors serve as protection from fall.

FIGURE 2.3.6 WALKWAY, OPENINGS AND STAIRS: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

2. Orientation: Color and Contract

- Different colors are used in each floor to provide sense of location to the low vision students. The memorizing colors of each can help students to locate the area and floor.

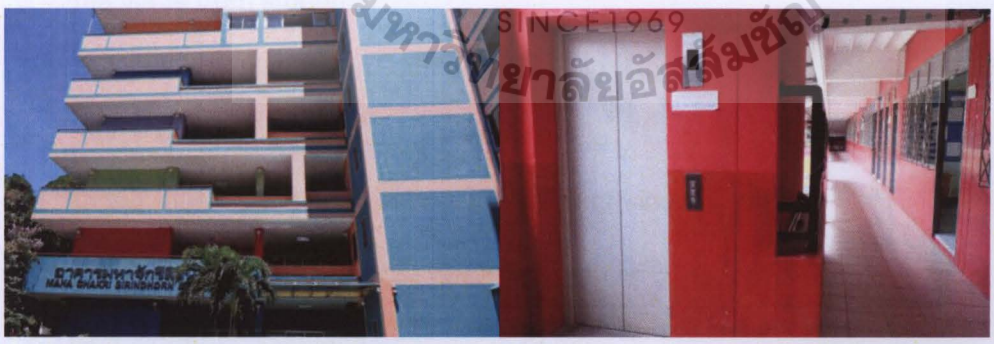


FIGURE 2.3.7 COLOR USED IN EACH FLOOR: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

3. Orentation: Stairs

- There are at least two stairs in every building and each of the stir are seperated into male and female to provide different routes to students. From the research, have seperated can help students with visual impairment to memorize their way.

FIGURE 2.3.8 COLOR USED IN EACH FLOOR: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

4. Vocational Classroom

- There are four types of vocational programs provide in this school; massage, computer, music and cooking. Among them message and computer class are most favorite due to their easy access for visual impaired students.
- In the massage class room, portable floor massage beds are provided for each student. Besides, there is a separated massage room for visitors or customers to get massage from students.
- For cooking classroom, different cooking area with steel counter provided for the students.
- In the music classroom, there are different kinds of musical instrument such as Thai traditional instruments such as heap, hammered dulcimer, and so on.
- The computer room provides audio system for the blind students for easier access. (see Figure 2.3.9)

FIGURE 2.3.9 VOCATIONAL CLASSROOM: PATTAYA REDEMPTORIST SCHOOL FOR THE BLIND

5. Information gather form the school about the activity of the visual impairment students

- Why guided dogs are not use in Thailand for mobility?

In Thailand guided dog are not popular to use in mobility as they need to be trained individually and required powerful partnerships with the blind person. It cost a great deal of time and effort to train a dog to become a guided dog. Besides, it takes a level of maturity, discipline, and commitment to work with a guide dog; the majority of person has to be 16 and older. There are a lot of places that do not allowed pet to enter.

- Method of O&M (Orientation and Mobility)

Trained to teach students with visual impairments the concepts, skills and techniques that enable them to travel safely and function efficiently in different conditions and situations in the environment. The range of techniques vary greatly and the O & M specialist will determine how best to teach the student. Arrange for a pair with other

students when going on a field trip or traveling in an unfamiliar environment. Mostly used a guided person to travel around the school.

- How to visual impaired students play sport?
- Swimming: similar to normal people swimming method, the net that create the lane guide direction for the students.
- Football: The ball has a bell inside to create the sound which guides the direction and location of the ball to the students.
- Goal ball: 3 x 3 students in each game, and the ball has bell inside.
- Running:
  - Low vision students run by them sometimes provide a robe from the start to the end to guide direction.
  - Blind students are running with a guided person who will lead the way or control the students from harm.

Analysis

<u>Advantages</u>

- Clear circulation and direction
- Metal fence and door for safety
- Provide a lot of outdoor area and play area
- Use of natural light
- Colors to navigate floor and area
- A good connection with the society and people

Disadvantages

- Do not have Acoustic design to prevent noise from and from other classroom
- Some corners do not have enough lighting
- Do not have enough W.C. in Building A and some are difficult to access.
- Do not have enough car parking
- Do not have any sensory feature (senses) to support the users

2.3.2 Secondary Case Study 1

Name: Center for the Blind and Visually Impaired, Mexico

Location: Mexico City, D.F., Mexico

Site Area: 8500 sq.m.

Project Year: 2001

FIGURE 2.3.10 CENTER FOR THE BLIND AND VISUALLY IMPAIRED

Project Background:

Center for the Blind and Visually Impaired was created as part of a program by the Mexico City government to provide services to one of the most disadvantaged and highly-populated areas of the city; Iztapalapa is the district with the largest visually impaired population in the Mexican capital. [13]

Object of study:

- To study the zoning and function
- To study the sensory design and features to support students

[13] "Center for the Blind and Visually Impaired / Taller de Arquitectura-Mauricio Rocha," ArchDaily, accessed October 15, 2015, http://www.archdaily.com/158301/center-for-the-blind-and-visually-impaired-taller-de-arquitectura-mauricio-rocha/. (no author)

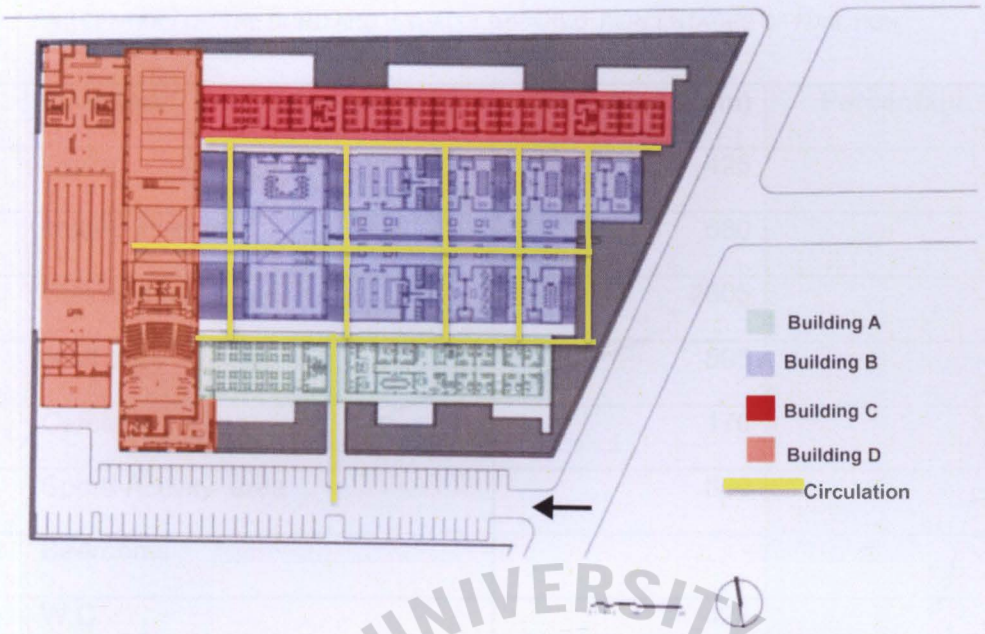


FIGURE 2.3.11 CIRCULATION ANALYSIS: CENTER FOR THE BLIND AND VISUALLY IMPAIRED

There is only one floor in this school, but there are four different buildings that serve with different zoning. Each building is connected with a walkway that serves as corridor and circulation which is "Cross Axial ". A large outdoor corridor is located in the middle of the building B.

TABLE 2.3.2 CENTER FOR THE BLIND AND VISUALLY IMPAIRED: PERCENTAGES OF FUNCTION

No.	Functions	Area (sqm)	Percentage (%)
1.	Lobby	425	5
2.	Multi-purposes	680	8
3.	Classrooms	2805	33
4.	Staff area	595	7
5.	Cafeteria	170	2
6.	Sport/ Activity area	850	10
7.	Bedrooms	-	-
8.	W.C	425	5
9.	Circulation	2125	25

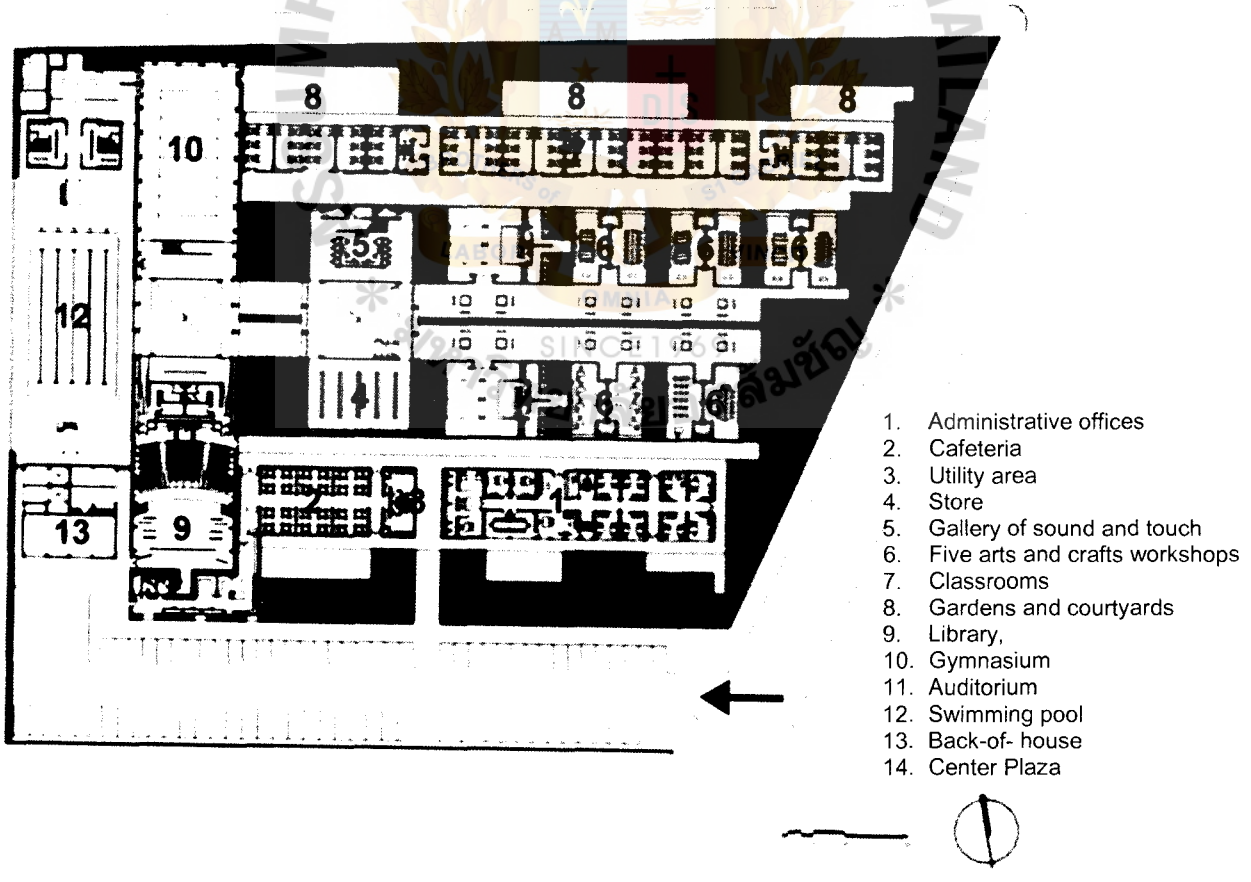


FIGURE 2.3.12 FLOOR PLAN: CENTER FOR THE BLIND AND VISUALLY IMPAIRED

Function and facility

- Administrative offices
- Gallery
- Center Plaza
- Library
- Auditorium
- Store
- Cafeteria
- Utility area
- Five arts and crafts workshops
- Classrooms
- Gymnasium
- Swimming pool
- Gardens
- Private courtyards
- Back-of- house

Specific design for the target user

FIGURE 2.3.13 BLIND WALL: CENTER FOR THE BLIND AND VISUALLY IMPAIRED

1. Noise Control

- The compound is surrounded by a blind wall in all four sides as an acoustic barrier. Also these walls create banks that transform form, height and composition and create some courtyard inside the compound.
- The buildings are in a rectangular shape with concrete frames and flat roofs. Even though each of the building has similar shape, making each space with different function and material and varying size, light intensity to identified for the user.

FIGURE 2.3.14 CENTRAL PLAZA: CENTER FOR THE BLIND AND VISUALLY IMPAIRED

2. Sensory Orientation

- There is a water channel runs through the center of the plaza, which the sound of the water guides users along their way which create experiences of using different senses and to deliver navigation to users.
- Besides, there are tactile sign and texture to give the location of each building on the concrete wall at hand height.

- There are various types of plants that have different fragrant in the central plaza along the water channel to act as sensor support to the users inside the complex.

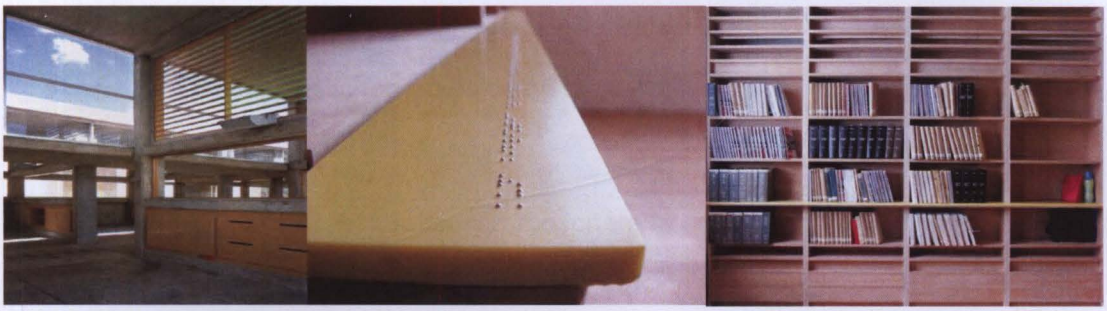


FIGURE 2.3.15 INTERIOR MATERIAL & SIGNAGE: CENTER FOR THE BLIND AND VISUALLY IMPAIRED

3. Signage and Color

- There is a water channel runs through the center of the plaza, which the sound of the water guides users along their way which create experiences of using different senses and to deliver navigation to users.
- Besides, there are tactile sign and texture to give the location of each building on the concrete wall at hand height.
- There are various types of plants that have different fragrant in the central plaza along the water channel to act as sensor support to the users inside the complex.

Analysis

Advantages

- Clear circulation and direction
- Secure and Acoustic form outside noise
- Suitable atmosphere to the user
- Provide a great deal of sensory atmosphere to communicate with smell, hearing and touch
- The enough texture, signage and braille to guide students to space

Disadvantages

- Separated from the society and do not have required commutation with people
- Create a lot of shadow from the roof and shading which can lead confused vision to the visual impairment

2.3.2 Secondary Case Study 2

Name: Hazelwood School for the Multiple Sensory Impaired

Location: 50 Dumbreck Court, Glasgow, City of Glasgow, G41 5NG, United Kingdom

Site Area: 2600 sq.m.

Project Year: 2007

Project Type: Educational, Elementary School for 2-18 years old

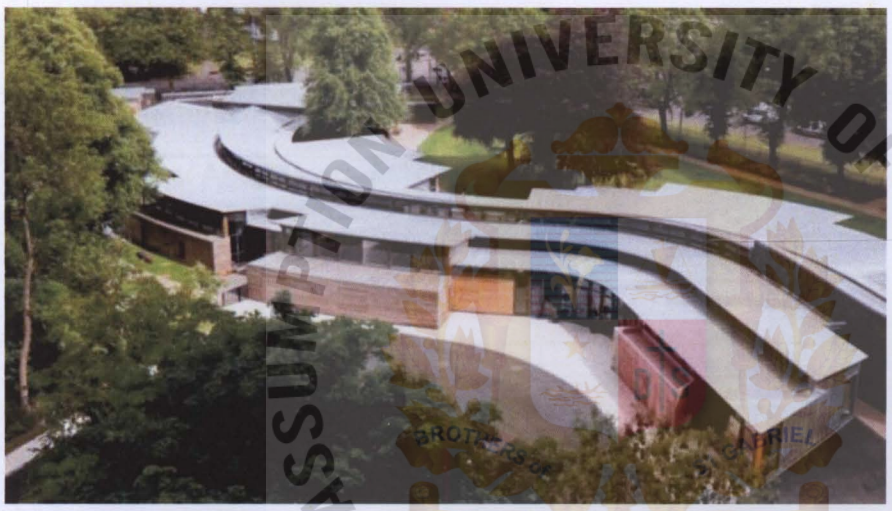


FIGURE 2.3.16 HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

Project Background:

Glasgow City Council Education Services Committee issued a consultative document on the proposed establishment of a new school for children and young people aged 2-18 who have a profile of multiple disabilities and visual impairment or dual sensory impairment. It is an advanced school for children with multiple disabilities and sensory impairments, and the school also fulfills a national function, with one pupil travelling daily from as far afield as Lockerbie. [14]

[14] "Hazelwood School For The Multiple Sensory Impaired," School Design Studio, accessed October 15, 2015, http://schoolstudio.typepad.com/school_design_studio/2008/10/hazelwood-schoo.html. (no author)

Object of study:

- To study the zoning and function
- To study the sensory design and features to support students

TABLE 2.3.3 HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED: PERCENTAGES OF FUNCTION

No.	Functions	Area (sqm)	Percentage (%)
1.	Lobby	52	2
2.	Multi-purposes	164	6.3
3.	Classrooms	780	30
4.	Staff area	260	10
5.	Cafeteria	44	1.7
6.	Sport/ Activity area	260	10
7.	Bedrooms	182	7
8.	W.C	260	10
9.	Circulation	520	20

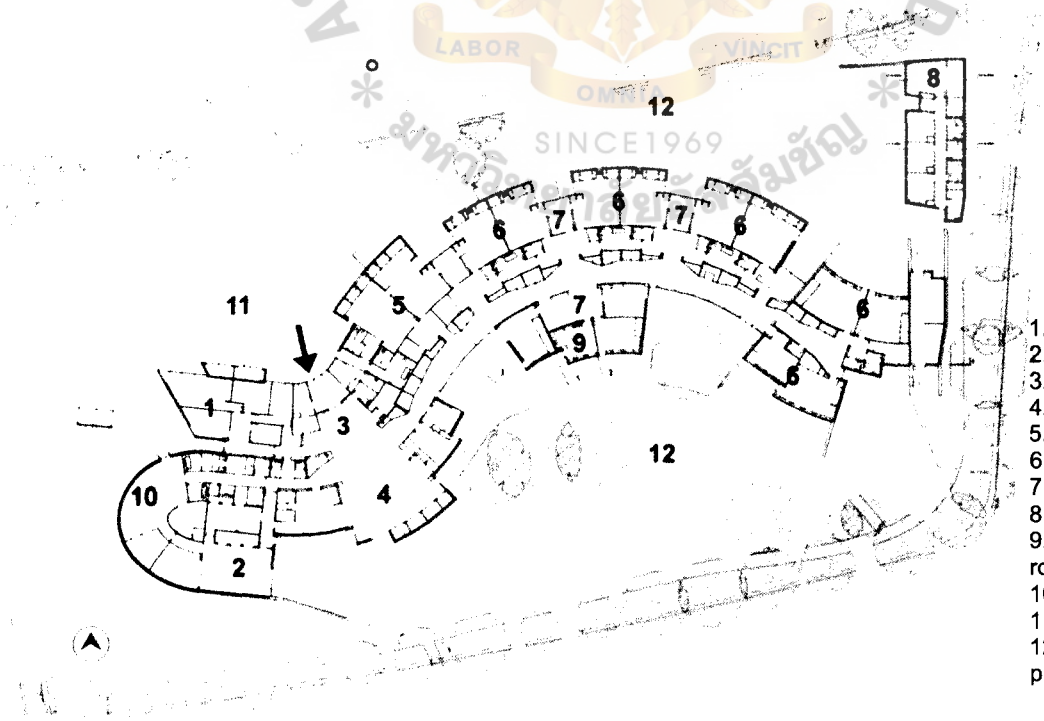


FIGURE 2.3.17 FLOOR PLAN: HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

Function and facility

- Administration office
- Lobby
- Sensory Wall
- Library
- Nursery
- Dining/assembly
- Kitchen
- General classrooms
- Music and art room
- Life-skills home
- Hydrotherapy pool
- Gym
- Changing rooms
- W.C.
- Garden and outdoor Playground

Specific design for the target user

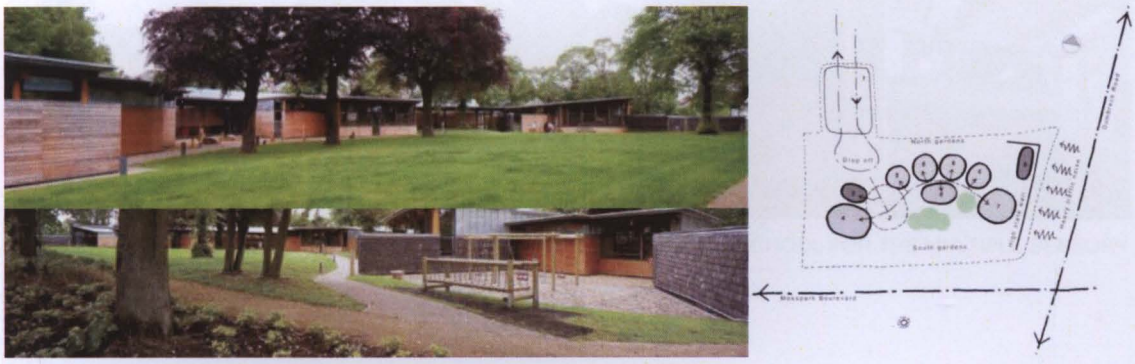


FIGURE 2.3.18 SITE AND SURROUNDING: HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

1. **Site Selection**

- Hazelwood is located on the site of a dairy near Glasgow's Bellahouston Park.
- Hazelwood's plan resembles "S" with its long axis running roughly east–west and design to be a large landscape which is to protect from the outside society and noise than architecture.
- The building wraps around mature beech trees and hidden to one side of an adjacent large public park.
- There are accesses between external environment with the teaching area, which allows students to intervene wind, rain and tree which support in their sensory experience.

2. **Noise Control and zoning**

- Classrooms face north to take advantage of even light without the confusing shadows of direct sunlight.
- Facades are clad with high slate wall are placed at the side of the main road to reduce the traffic noise with different heights to provide further visual differentiation and tactile cues to assist children with orientation and navigation through the school. (see Figure 2.3.16)

FIGURE 2.3.19 OPENINGS AND EXTERIOR MATERIAL: HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

3. Openings and Exterior material

- Louver-protected glazing and clerestory windows surround the internal street, showering it with daylight.
- Clerestories dominate the classrooms, since expansive full-height windows could distract those students who have partial sight.
- Exterior of the building is wrapped around with timber, which the architect calls "warm and good to touch—it creates a non-institutional feeling."
- Aluminum and PVC sheeting were used for the roof.
- There are few handrails; instead blind students follow a "sensory wall" lining one side of the internal street.

FIGURE 2.3.20 COLOR CONTRACT AND INTERIOR MATERIAL: HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

4. Materials

- Timber is used as a key building material because of its emotive, warm, tactile, and good smell. The timber cladding is larch produced from a sustainable source. Clad are used as baffle walls, built to reduce traffic noise.
- Acoustic ceilings are in all teaching spaces to reduce higher volume reverberation.
- Color coded to assist navigation - nursery (yellow), primary (red) and secondary (maroon).

FIGURE 2.3.21 COLOR CONTRACT AND INTERIOR MATERIAL: HAZELWOOD SCHOOL FOR THE MULTIPLE SENSORY IMPAIRED

5. Touch Surface for Orientation

- The central corridor boasts with a so-called sensory wall which appears like unfurled origami.
- Students trace the folds of the wall and the channels in its cork-covered surface to guide themselves between destinations.
- Redundant signage and Braille are catered throughout the school for the diverse communication abilities of all of the children.

Analysis

Advantages

- Secure environment with required amount of connection with society
- Provide a lot of outdoor space
- Zoning with environmental factors
- Detailed design for the users with material and texture
- Provide enough signage and braille for direction
- Special sensory wall for blind students
- Used of differing tactile floor and wall finishes for easier navigation for students
- Clerestory glazing and large-glazed screens provide enough natural light and to reduce electrical consumption
- Used of natural material

Disadvantages

- Not enough space for sport
- Too many colors inside the play room and swimming pool can lead confused vision to the visual impairment

2.3.2 Secondary Case Study 3

Name: Grousbeck Center for Students and Technology at Perkins School for the Blind

Location: Watertown, Massachusetts, USA

Site Area: 3000 sq.m.

Project Year: 2011

Project Type: Social and Teaching Center

FIGURE 2.3.22 GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND

Project Background:

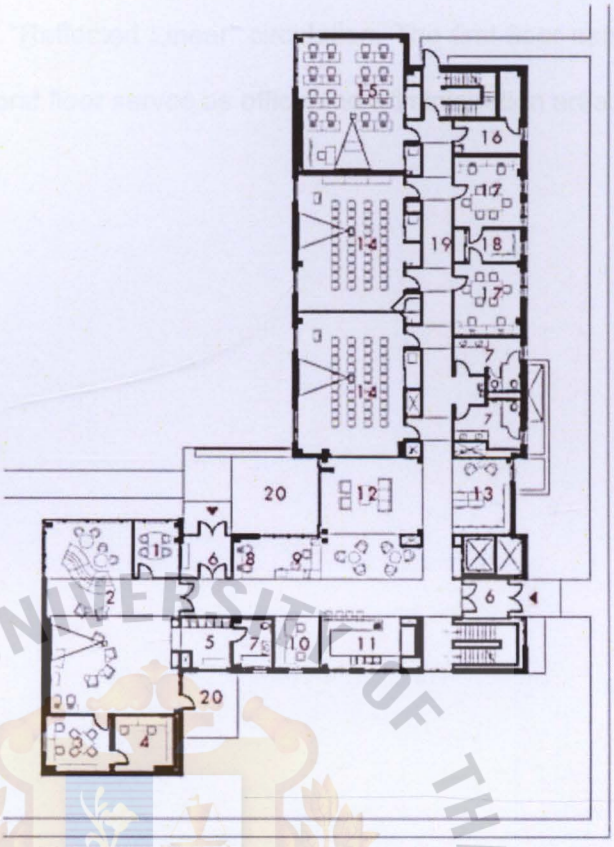
Perkins is the nation's first school for students with visual impairments, and provides education and services to help build productive, meaningful lives. The Grousbeck Center for Students & Technology a place where visually impaired students can be brought into the vernacular of today's culture, so heavily entrenched in technology, innovation, communication and independence, and also training programs and educational outreach.[15]

Object of study:

- To study the zoning and function
- To study the sensory design and features to support students.

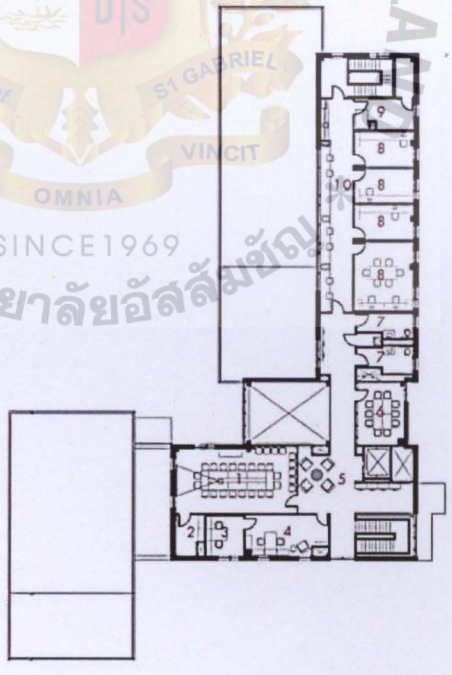
[15] "Grousbeck Center for Students & Technology, Perkins," GRUNDPartnership, accessed October 15, 2015, http://www.gundpartnership.com/Grousbeck-Center-Perkins. (no author)

1. Quiet study
2. Student center
3. Music
4. Radio
5. Wardrobe
6. Foyer
7. Restroom
8. Tech lounge
9. Reception
10. Booth seating
11. Café
12. Lobby
13. Tech display
14. Multi-purposes
15. Classrooms
16. Back-of-house
17. Flexible space
18. Copy
19. Corridor
20. Patio



FIRST FLOOR PLAN

1. Conference
2. Storage
3. Assessment room
4. Adaptive tech display
5. Lobby
6. Meeting
7. Restroom
8. Office
9. Back-of-house
10. Corridor



SECOND FLOOR PLAN

FIGURE 2.3.23 FLOOR PLAN: GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND.

It is two stories-building with "Reflected Linear" circulation. The first floor serves as classrooms and public zone and second floor serves as office and administration area.

Function and facility

- Student center
- Tech lounge & Tech display
- Café
- Lobby
- Multi-purposes
- Classrooms
- Back-of-house
- Administration office
- Conference
- Storage
- Assessment room
- Office
- Library
- W.C.

TABLE 2.3.4 GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND: PERCENTAGES OF FUNCTION

No.	Functions	Area (sqm)	Percentage (%)
1.	Lobby	150	5
2.	Multi-purposes	570	19
3.	Classrooms	840	28
4.	Staff area	600	20
5.	Cafeteria	90	3
6.	Sport/ Activity area	-	-
7.	Bedrooms	-	-
8.	W.C	120	4
9.	Circulation	600	20

Specific design for the target user

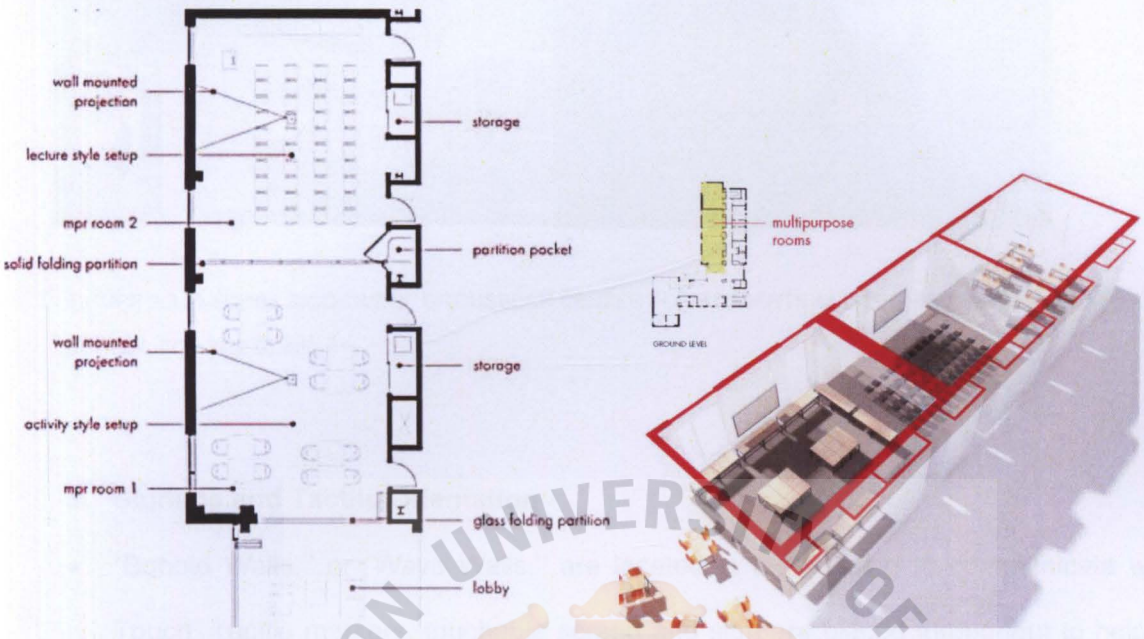


FIGURE 2.3.24 CLASSROOMS: GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND

1. **Flexible Layout**

- Classrooms can be expanded to support educational programs along with the storages in the outer wall of the classroom which give sound insulation.
- There is student social hub with the combination of technology and recreation activity for both education and vocational training.

2. **Lighting**

- Natural lighting are used most of the central lobby and entrances with large windows. Colorful walls are provided for users who have low vision.
- The corridor ceiling are lower than other rooms with a material that reflects sound to navigate with ears for visual impairment.

FIGURE 2.3.25 LOBBY & CORRIDO: GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND

3. Signage and Tactile Orientation

- "Bubble Walls," or "Wave Walls," are located in the building to communicate with Touch. Tactile markers, touchable screen and sign are placed throughout to help in orientation.
- Besides, wall-mounted cast gypsum panels with different textured surfaces are located throughout the building for navigation.
- Used of different textured floor surfaces such as polished concrete floors, textured rubber panels and carpet tiles to provide direction especially for people with cane.

FIGURE 2.3.26 LOBBY & CORRIDOR: GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND

4. Audio Sign and Orientation

- iPads are inserted in the building as well as VoiceOver, an audio screen reader and the screen magnifier that enlarges text on the screen which are an important role in making the systems accessible.

FIGURE 2.3.27 AUDIO SCREEN & ENLARGE PRINT: GROUSBECK CENTER FOR STUDENTS AND TECHNOLOGY AT PERKINS SCHOOL FOR THE BLIND

Analysis

Advantages

- Clear circulation and direction.
- Flexible zoning and multi-functional space.
- Good amount of lighting, natural light.
- Used of sound and touch to provide navigation to visual impaired students.
- Used of innovated technique and material to support student's needs.
- Provide easy, intuitive and accessible system with the use of technology for universal accessibility.

Disadvantages

- The location of the site is in the university campus even though its creates connection with people it might not comfortable for visual impairment students.
- Mix of users (not only for visual impairment also for other university students).

TABLE 2.3.5 ANALYSIS OF EACH CASE STUDY

Category	Pattaya Redemptorist School for the blind	Center for the Blind and Visually Impaired, Mexico	Hazelwood School for the Multiple Sensory Impaired	Grousbeck Center for Students at Perkins School for the Blind
Purpose	Secondary and Vocational School	Educational School	Elementary School	Social and Teaching Center
Area (sq.m)	6400	14000	2600	3000
Universal Design	-Ramp -Metal fence & door for safety -Handrails provide everywhere	-Braille Signage on furniture and wall surface -Noise Control	-Braille Signage on furniture and wall surface -Ramp -Handrail	-Flexible furniture layout -Audio direction -Braille and texture signage
Circulation	Reflected Linear	Cross Axial	Reflected Linear	Reflected Linear
Lighting	-Use of natural light -Do not have enough lighting in some of the corridor	-Use of natural light with -Cast shadow	-Use of natural light with louver-protected glazing and clerestory windows	-Use of natural light with large glazing
Noise	Do not have acoustic in classroom to prevent noise form outside	–	Installed acoustic treatment in classroom ceiling	–
Material	-Concrete -Brick -Metal	Natural Material -Concrete -Natural stone -Temperate brick -Wood	Natural Material -Timber -Clad -Cork	Sustainable Material -Brick -Aluminum panels -Slate roofs -Carpet

Colors	-For easy navigation -Blue, red, green, purple and orange	-Warm and serenity -Yellow and brown	-Subtle and contrast -Yellow, red and maroon	-Bright and calm -Blue, green and
Sensory design to support the user	_	-Use of water flowing sound -Smell of different plants to identify place -Texture on the concrete wall for direction	-Connected to the exterior to express nature by sound -A tactile-cork wall with different heights to help orientation of student with touch	-Gypsum and Bubble wall to navigate direction by touch -Use of iPad with installation to support sound for direction

2.4 Site Study

2.4.1 Site Approach

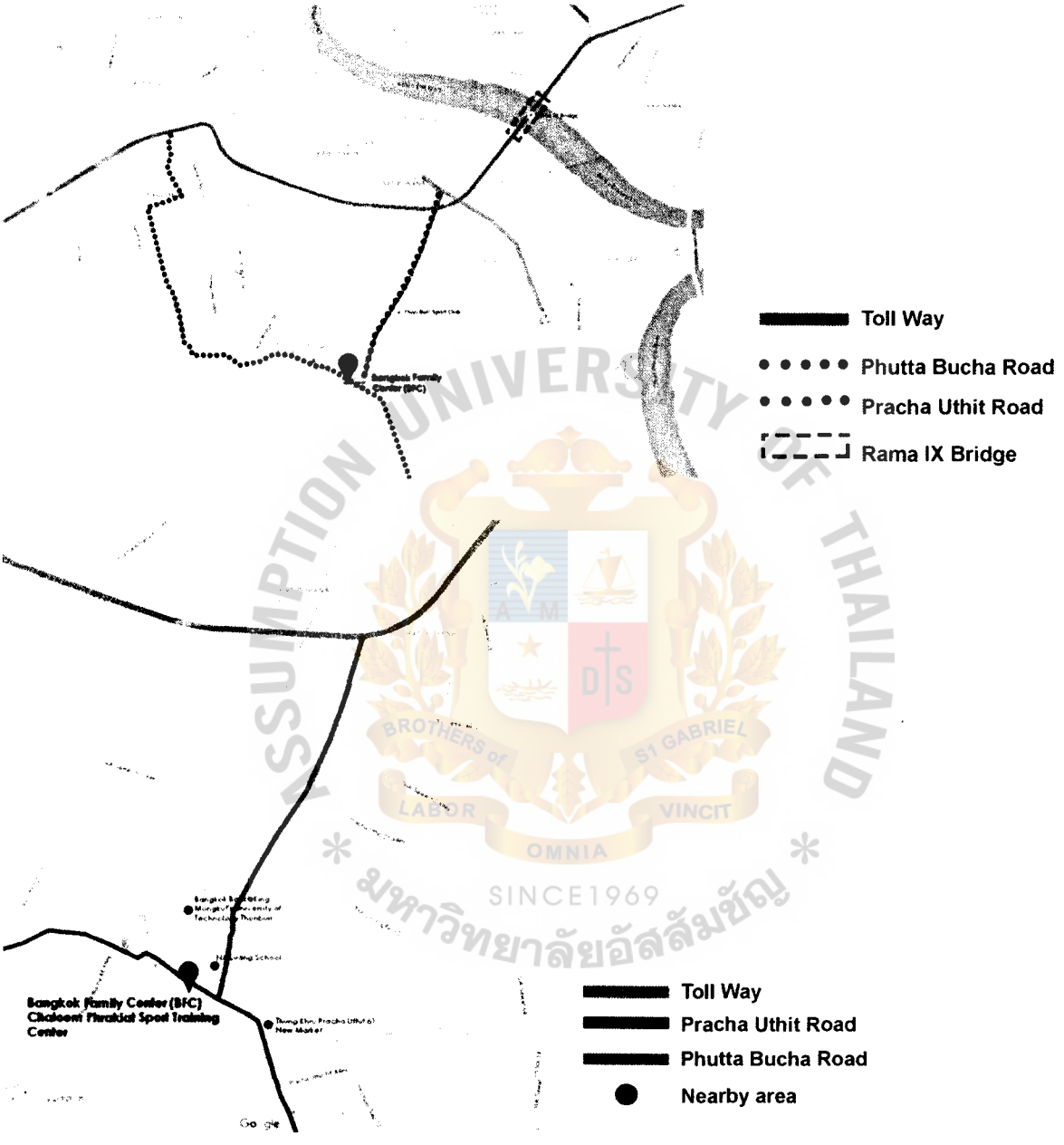


FIGURE 2.4.1 BANGKOK FAMILY CENTER (BFC)

The site is located in the Memorial Sports Center on the Pracha Uthit Road. Even though, it is not visual appeared from the façade, once enter from the gate of the Sports Center, the site is surrounded by various types of sport field.

2.4.2 Site Orientation and Environmental Surrounding

Site Context

Location: 60 Moo 1 Phuttha Bucha Road, Bang mot Sub-District, Thung Khru District 10140

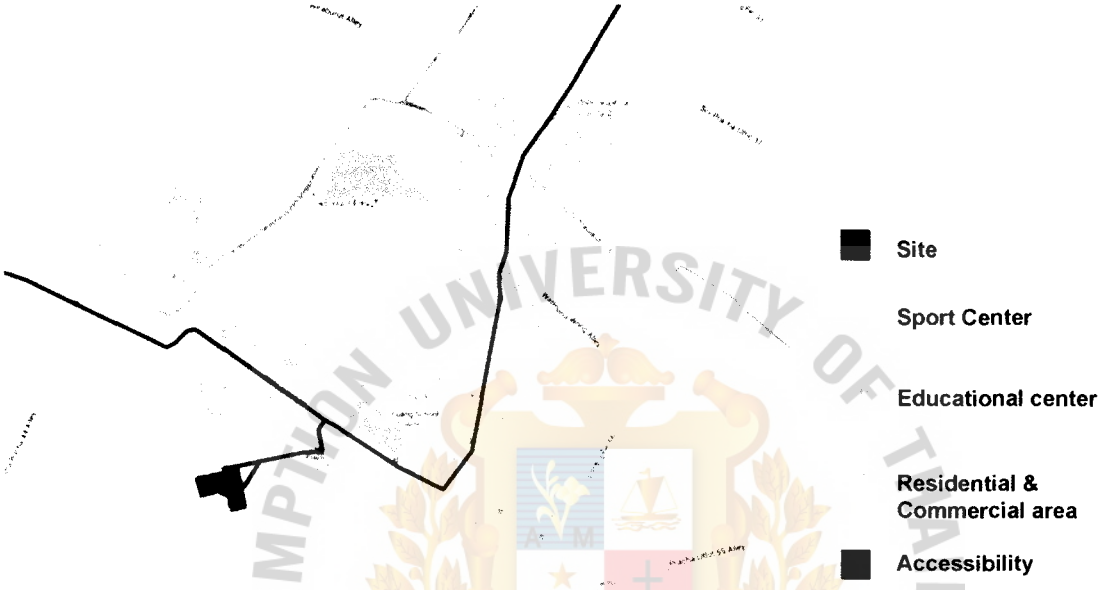


FIGURE 2.4.2 SITE ORIENTATIONS AND ENVIRONMENTAL SURROUNDING

The site is surrounding by various types of sport fields as it is located in the Sport Center. There are many educational centers around the center such as in front of the sport center is Na Laung School, and also near to Bangkok Bank at King Mongkut's University of Technology Thonburi as well. Along the way to the site are surrounded with commercial and residential area. It is closed to Tesco Lotus and Market Value shopping mall and Thung Khru Pracha Uthit 61 New Market.

Site Surrounding

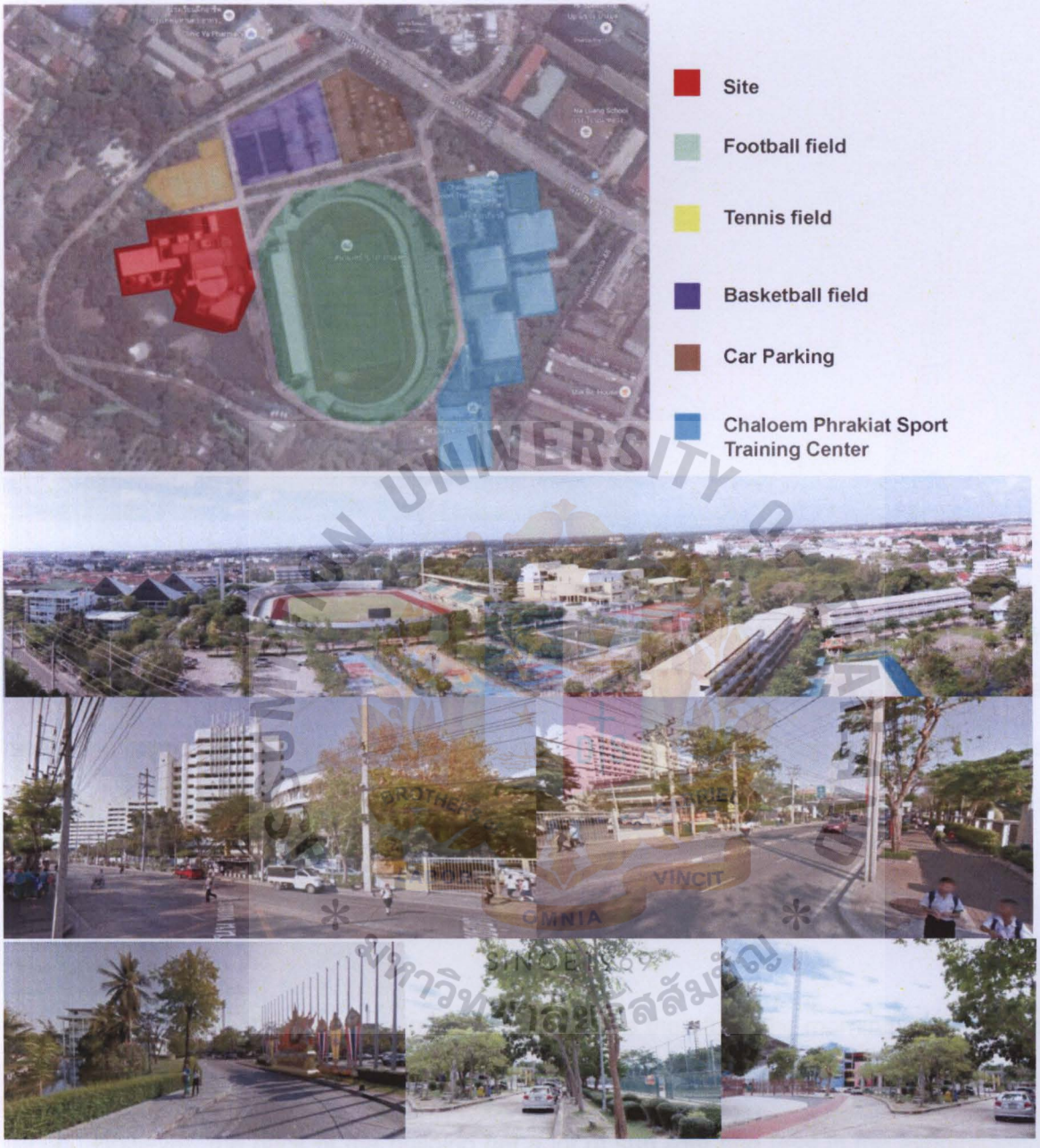


FIGURE 2.4.3 SITE SURROUNDING

Climate

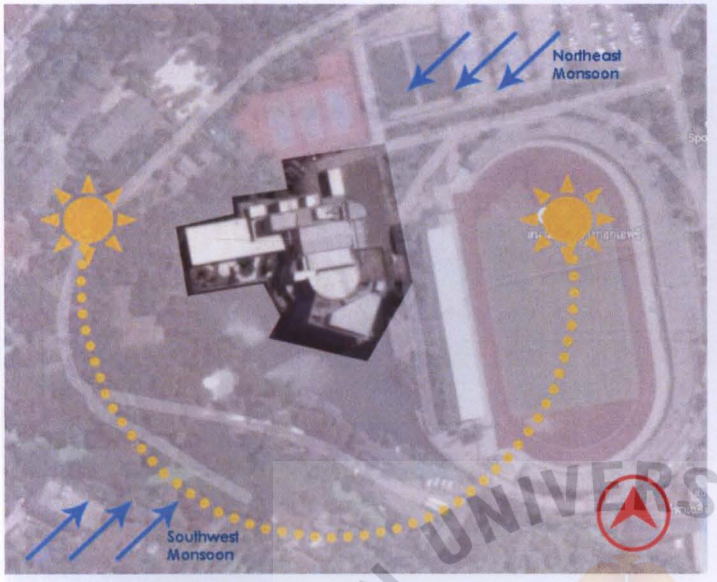


FIGURE 2.4.4 SITE CLIMATE

Bangkok has a tropical monsoon climate and the highest average temperature of any city in the world. Temperatures in Bangkok regularly stay well above 30°C throughout the year. The humidity levels also remain high during this period and you can expect short spells of rainy weather, with frequent afternoon showers, monsoons and spells of thunder at times.[16]

Sun direction:

- There is a football stadium in front of the façade therefore, the morning time the sun light do not produced directly to the building.
- However, the back of the building get a lot of sun light and heat in the evening time as it is faced to the West. Also there are a small pond and forest at the back.

Wind:

- There is no high raised building s or any other buildings blocking the site, it gets a very good amount of ventilation.

[16] "Bangkok Monthly Climate Average," Thailand World Weather Online, accessed December 19,2015, http://www.worldweatheronline.com/Bangkok-weather-averages/Krung-Thep/TH.aspx. (no author)

2.5 Existing Building Study

2.5.1 Existing Building System

Name: Bangkok Family Center (BFC)

Project Type: Children museum

Target group: Family and Children

Total Area: 8000 square meters

Two Buildings connected with bridges in each floor.

FIGURE 2.5.1 BANGKOK FAMILY CENTER (BFC)

Bangkok Family Center (BFC) is located in Memorial Sports Centre. (Mot) Road. Pracha Uthit Thung Khru Bangkok Bangmod concept of the child and the family spent time together with the creative learning process. The main target group is children aged 6-12 years from a community school in Bangkok, inter alia, that a family member does not mean just the same, but include people who share an everlasting life in a small community or local level.

Zoning

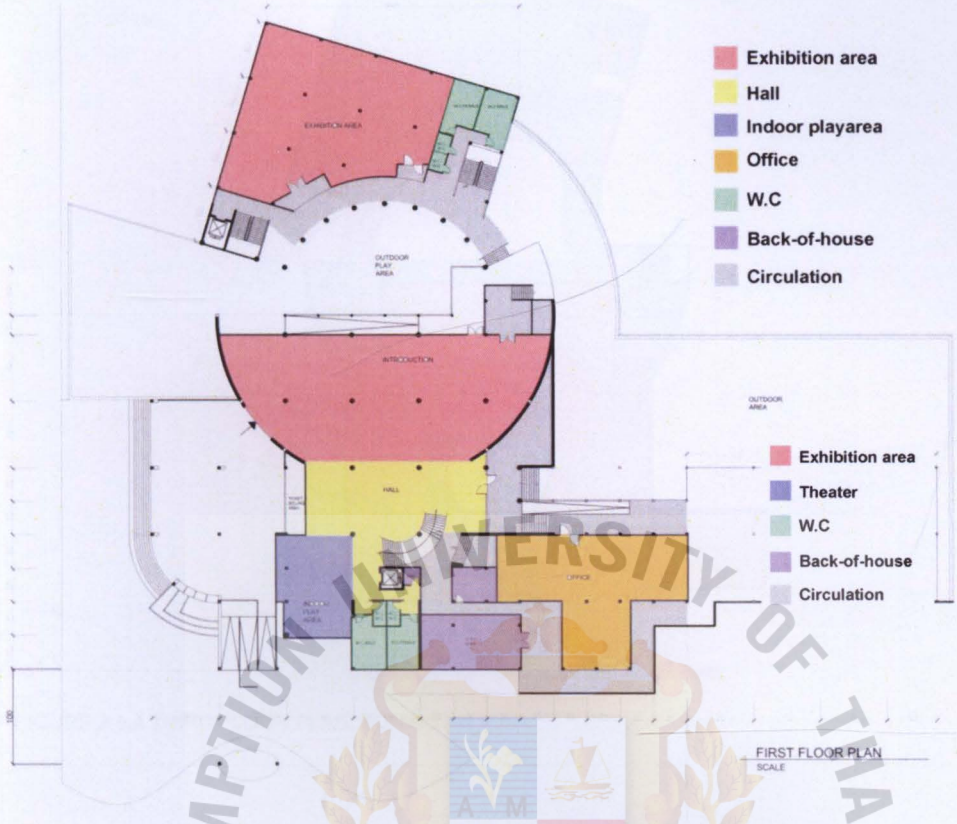


FIGURE 2.5.2 FIRST FLOOR PLAN: ZONING

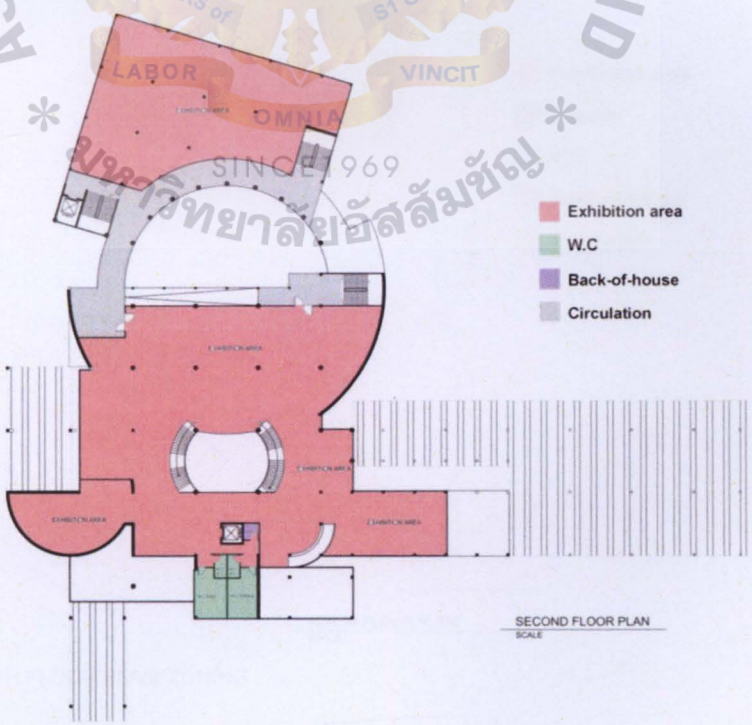


FIGURE 2.5.3 SECOND FLOOR PLAN: ZONING

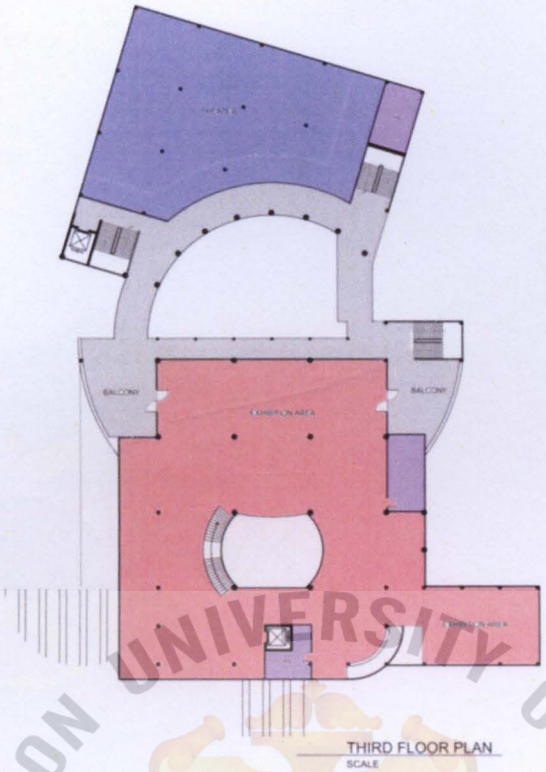


FIGURE 2.5.4 THIRD FLOOR PLAN: ZONING

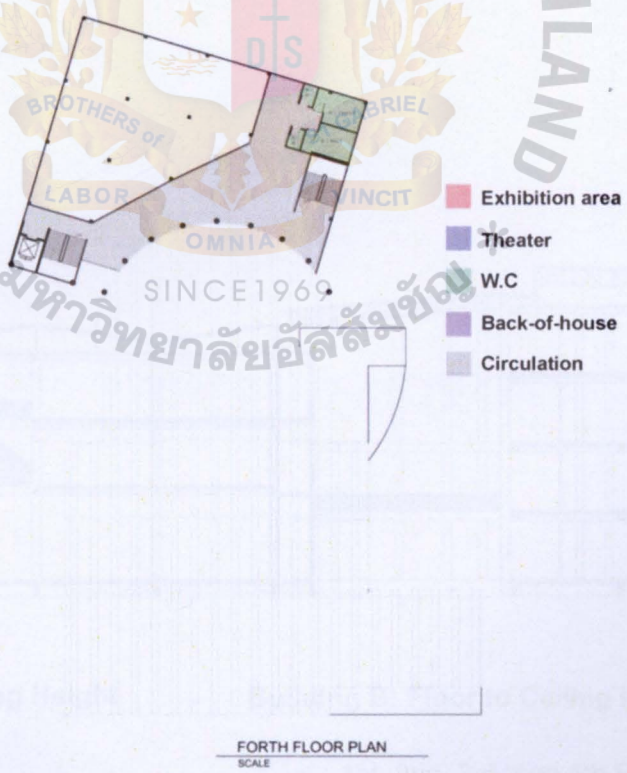


FIGURE 2.5.5 FORTH FLOOR PLAN: ZONING

Building Accessibility

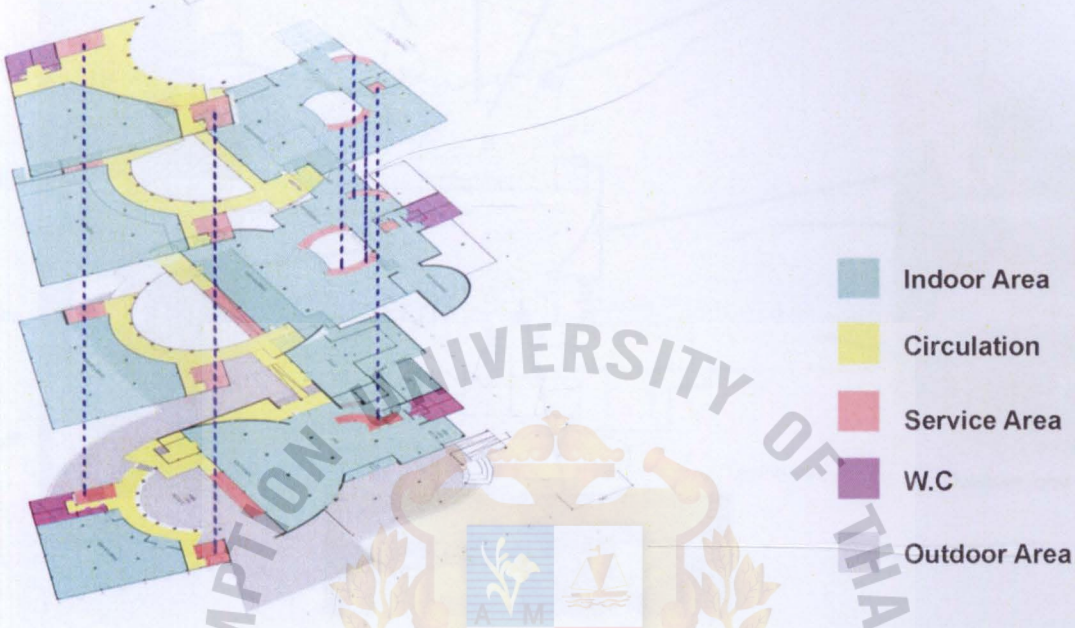


FIGURE 2.5.6 BUILDING ACCESSIBILITY

Section

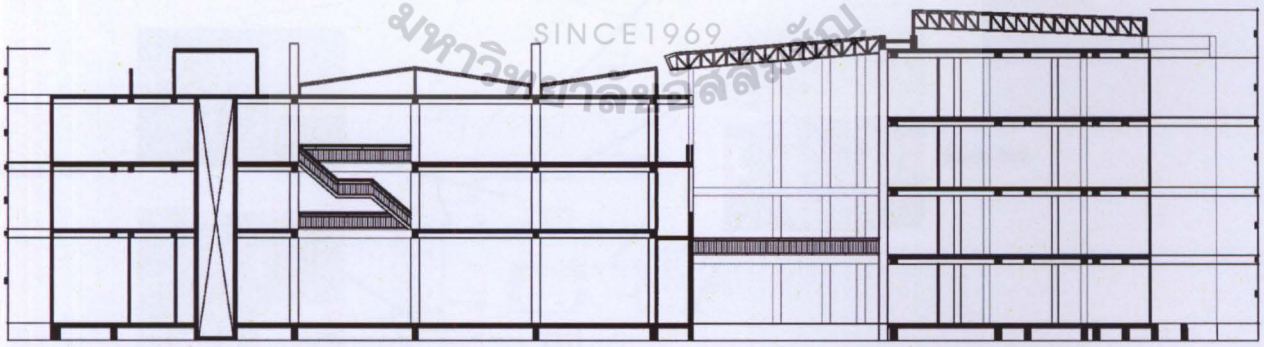


FIGURE 2.5.7 SECTION

Building A: Floor to Ceiling Height

- 1st Floor: 4.00 m
- 2nd & 3rd Floor: 3.00 m

Building B: Floor to Ceiling Height

- 1st, 2nd, 3rd and 4th Floor: 3.00 m

Interior

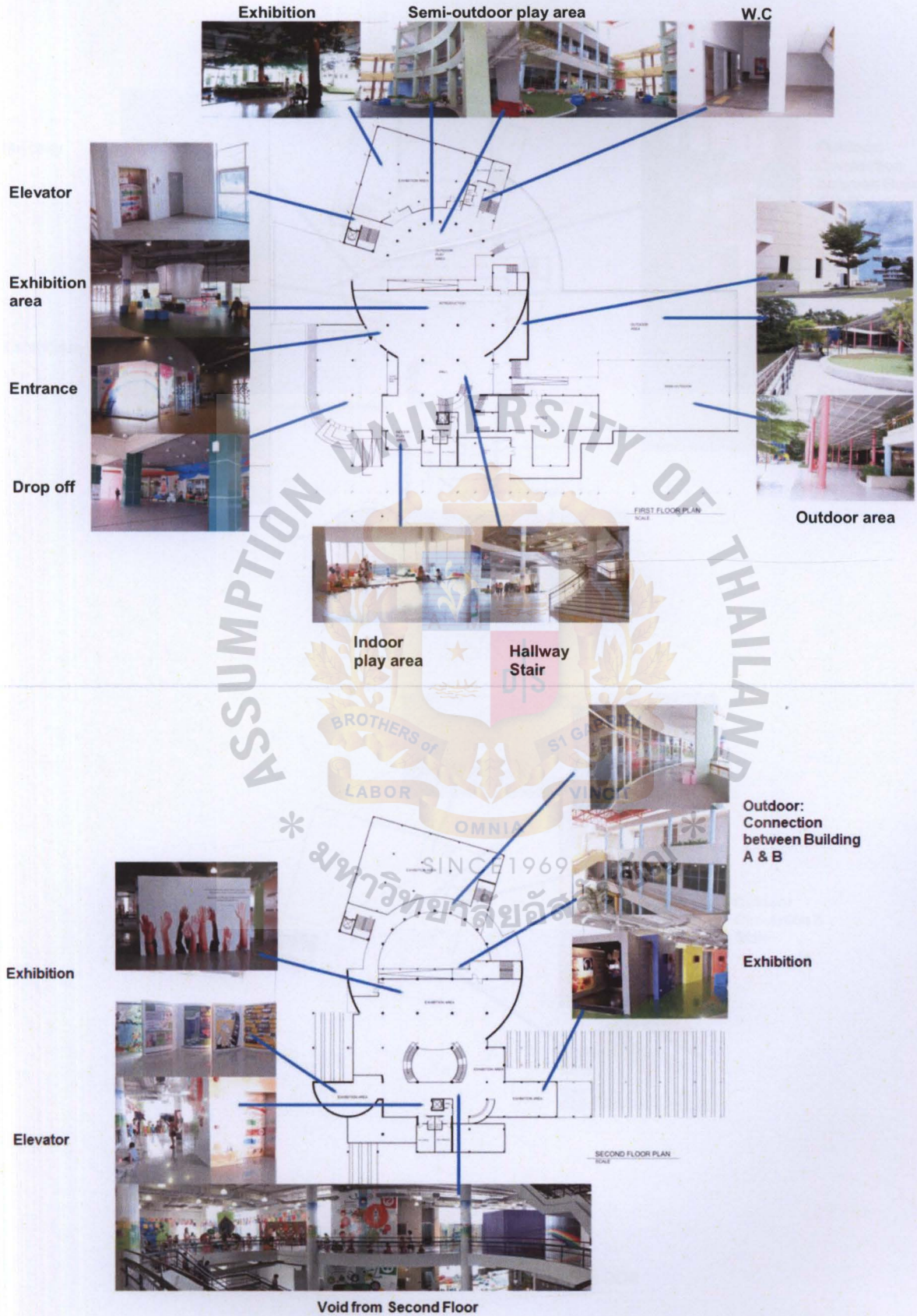


FIGURE 2.5.8 EXISTING BUILDING FIRST & SECOND FLOOR

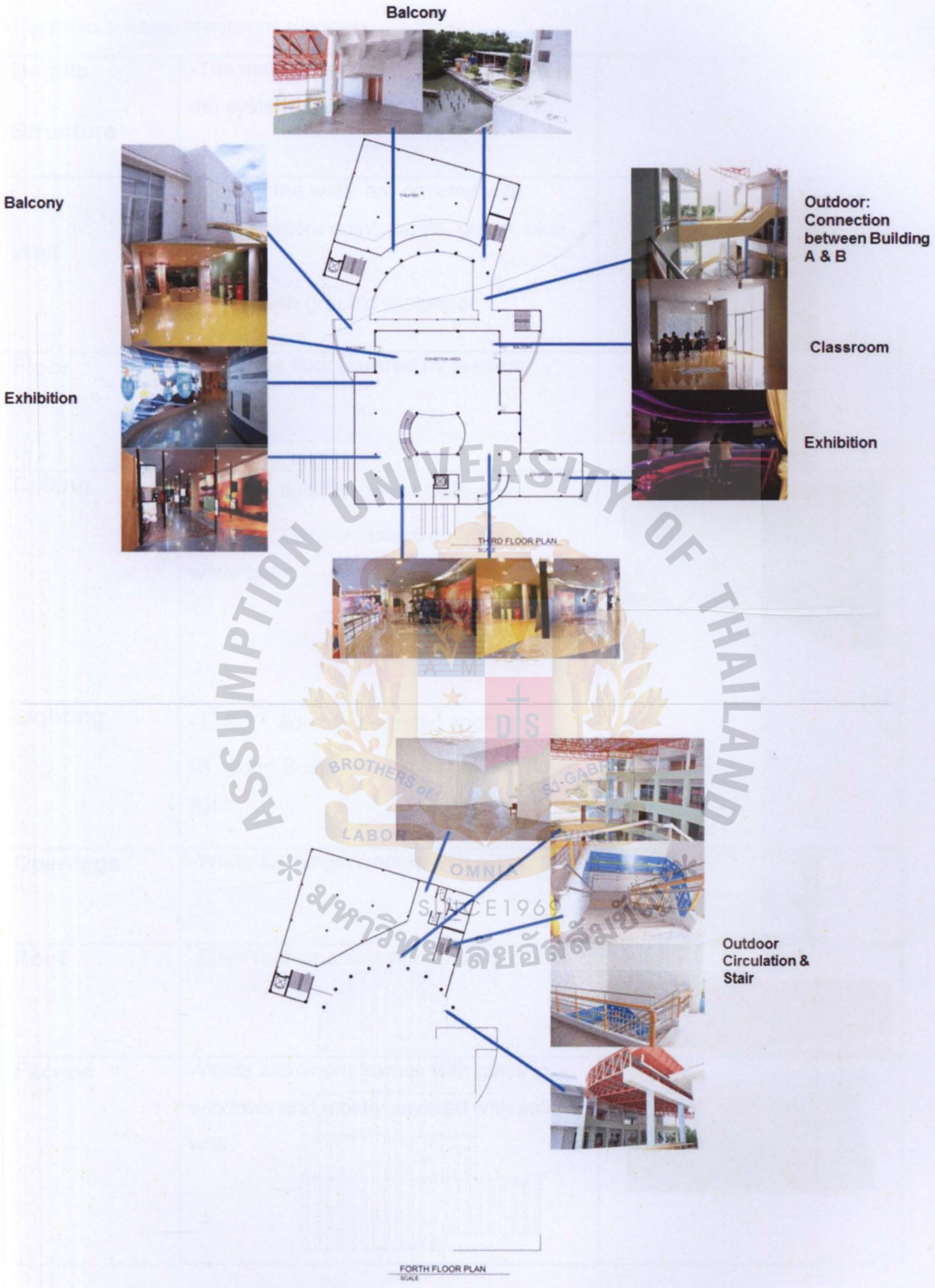
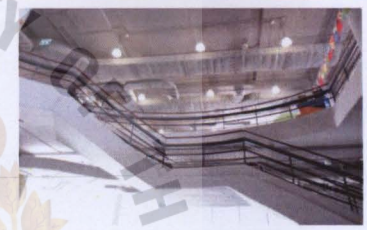


FIGURE 2.5.9 EXISTING BUILDING THIRD & FORTH FLOOR

TABLE 2.5.1 BUILDING STRUCTURE & SYSTEM

Details **Structure**	-The main construction of the building is the system of post and beam.	
Wall	-Most of the walls are covered with various colors paint. (white, green, blue and red) -Cover with graphic wallpaper.	
Floor	-Concrete floor covered by resilient flooring.	
Ceiling	-1st & 2nd floor: Exposed Ceiling. -3rd floor: Gypsum board covered with white paint.	
Lighting	-1st & 2nd floor: Suspended spotlight. -3rd floor: Suspended spotlight and down light.	
Openings	-White aluminum frames with glass.	
Roof	-Steel roof structure with roof sheeting.	
Facade	-White aluminum frames with glass in windows and mostly covered with solid wall.	

2.5.2 Existing Building Problems and Solutions

TABLE 2.5.2 BUILDING PROBLEMS& SOLUTIONS

Problems	Solutions
Void	
There are voids in Building A from 1st to 3rd floor, which is not suitable for the target users.	Redesign or close the void.
Elevator	
There is only one elevator in each building which is not enough for the visual impairment center.	Add more elevation in both buildings.
Stairs	
The existing stairs are curved form, which is not suitable for the visual disability.	Rearrange and redesign stairs according to the Disability Act.
Façade	
The existing façade does not provide natural sunlight into space.	Create more opening to get sunlight and ventilation.
Handrail	
Protection elements such as hailing and fence do not have in the existing building.	Add fence and railing which are important for visual impairment for protection.

Chapter 3: Data Collections

Chapter 3: Data Collections

Chapter 3: Data Collections

3.1 Target User Studies

3.1.1 Organization Chart

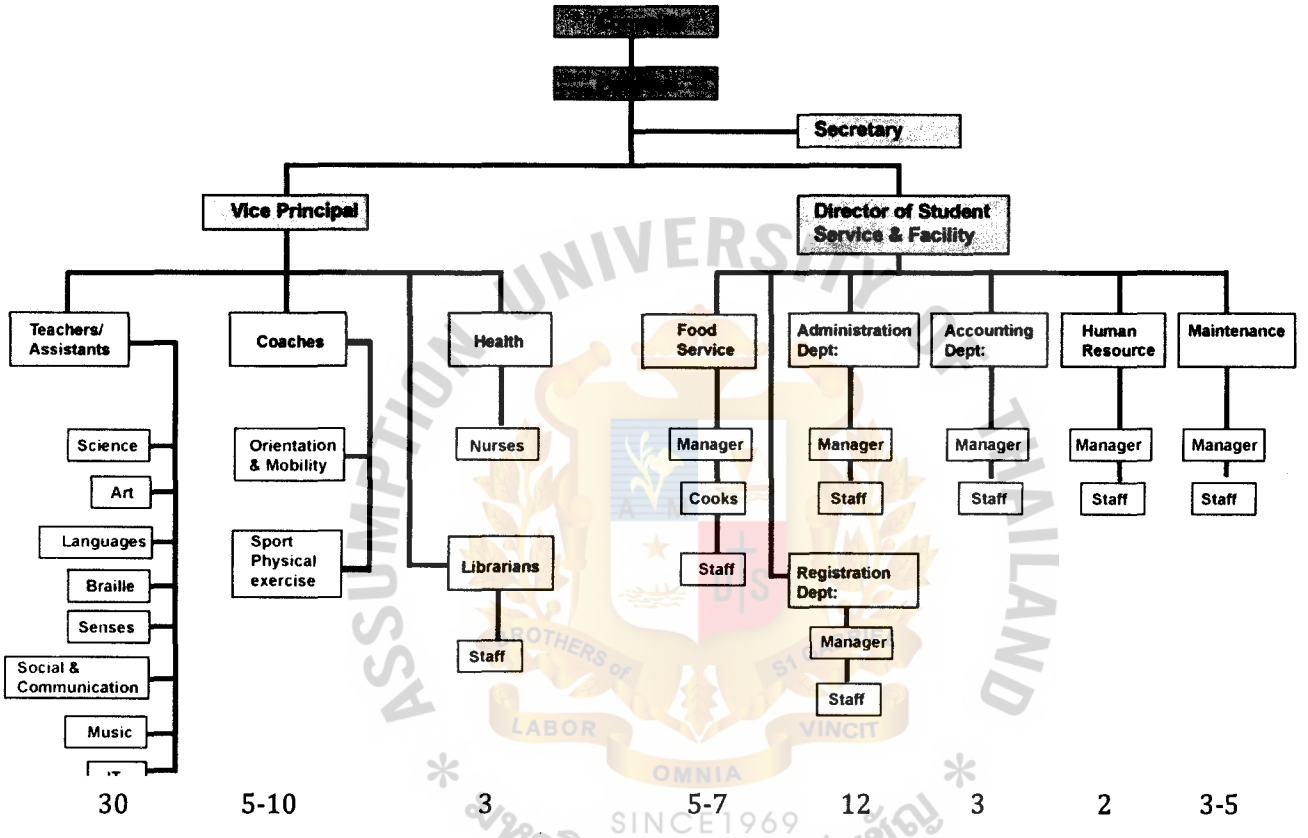


FIGURE 3.2.1 PROJECT ORGANIZATION CHART

- There are around 150 students, one teacher or lecture: 5 students, therefore, there are 30-35 teachers in the school including vocational and educational teachers.
- There are total of 12-15 staffs in the administration, accounting and registration office and total of 10-15 staffs in the maintenance and cooking department.

3.1.2 Target User Identities

TABLE 3.1.1 CLASSIFICATION OF VISUAL IMPAIRMENT

Low Vision	VF loss of <100 from point of fixation but who uses, or is potentially able to use, vision for the planning/execution of task. *(Standard Definition (WHO 1992)*
Blindness	Visual acuity of less than < 20, or a corresponding visual field loss to less than 10°, in the better eye with the best possible correction. *(Vision 2020 - World Health Organization)*

Percentage of Low vision & Blind Population

World wide World wide (children)

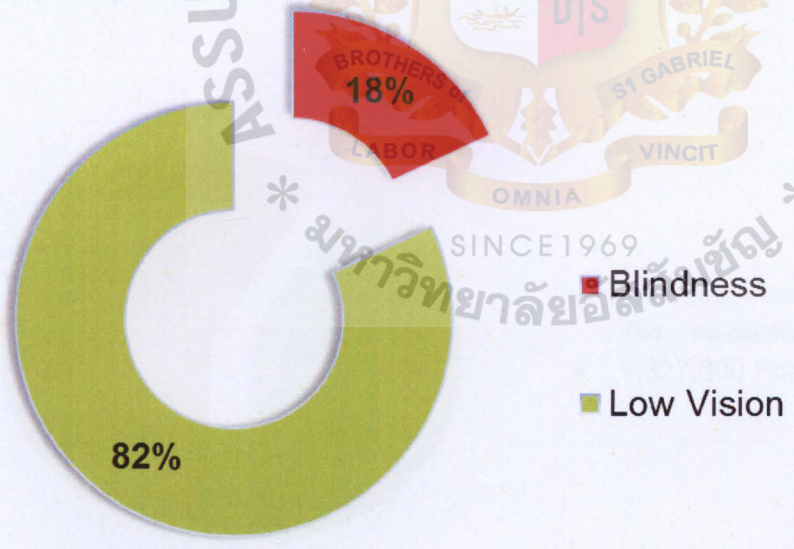
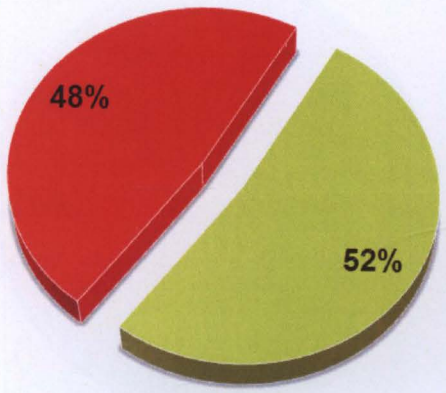


FIGURE 3.1.1 PERCENTAGE OF LOW VISION & BLIND POPULATION

Disability Statistics: Visual Disability

American Community Survey (2013)

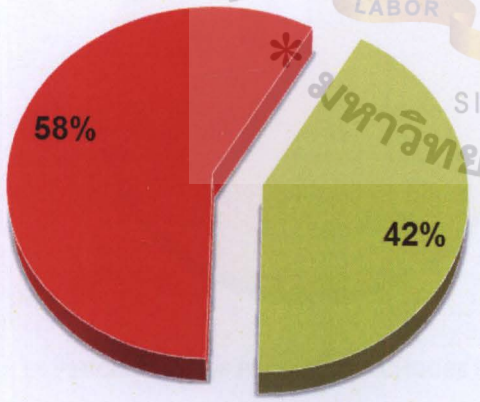


- Males & Females, ages 4 and under through 20, all races, regardless of ethnicity
- 694,300 Population

FIGURE 3.1.2 PERCENTAGE OF DISABILITY STATISTICS: VISUAL DISABILITY

Prevalence of Visual Disability:

Blindness among adults (2013)



- Male and Female, ages 16 through 75+, all races, regardless of ethnicity
- 7,327,800 Population

FIGURE 3.1.3 PERCENTAGE OF PREVALENCE OF VISUAL DISABILITY

Percentage of Target Group

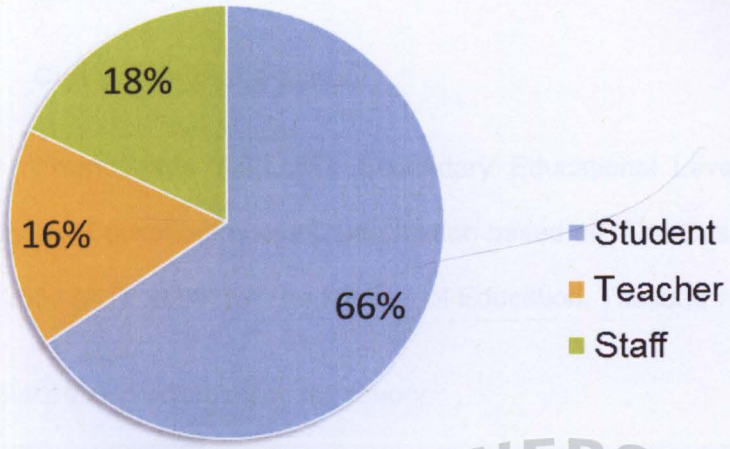


FIGURE 3.1.4 PERCENTAGE OF TARGET USER

Percentage of People who choose Education Style

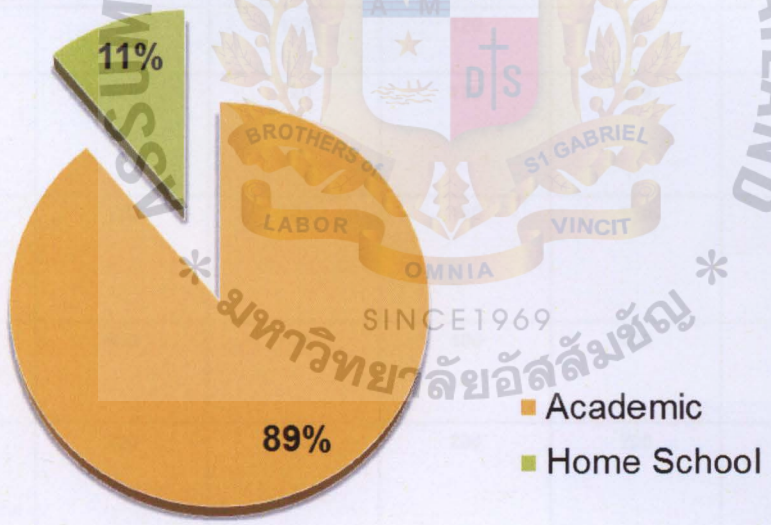


FIGURE 3.1.5 PERCENTAGE OF PEOPLE WHO CHOOSE EDUCATION STYLE

- From the result of the questionnaire, most of the people chose to send the Academic Education (89%), while only11% chose to home school children with visual impairment.

3.2 Proposed User Behavior

3.2.1 Project Schedule

Curriculum of the school

From Grade 7-9(Lower Secondary Educational Level) and Grade 10-12 (Upper Secondary Educational Level). Information based on "The Basic Education Core Curriculum B.E. 2551 (A.D. 2008) by The Ministry of Education, Thailand". [17]

TABLE 3.2.2 CURRICULUM OF THE SCHOOL

	Learning Time (hours per year)					
	Lower Secondary Education Level			Upper Secondary Education Level		
Subjects	**Grade 7**	**Grade 8**	**Grade 9**	**Grade 10**	**Grade 11**	**Grade 12**
Thai Language	120	120	120	120	120	120
English	120	120	120	120	120	120
Mathematics	120	120	120	120	120	120
Science (Physic, Chemistry & Biology)	120	120	120	120	120	120
Social Study (History & Geography)	120	120	120	120	120	120
Vocational (Music, Art, Handcraft & Computer)	400	400	400	400	400	400
Sport (Physical exercise, Yoga, Table tennis, Goal ball & Swimming)	200	200	200	200	200	200

[17]The Ministry of Education, *The Basic Education Core Curriculum, B.E. 2551 (A.D. 2008)* (Bangkok: The Ministry of Education, 2008), 25, http://www.act.ac.th/document/1741.pdf.

Timetable

1. For Grade 7-9 (Lower Secondary Education level)

Timetable for Grade 7-9 (Lower Secondary Education Level), Learning classes are in the morning before lunch time. Vocational classes are after lunch time followed by Sport. Vocational training classes are according to the students' choice as well as Sport. Sport hour is not an hour fixed, can be flexible according to students ability.

TABLE 3.2.3 TIMETABLE FOR GRADE 7-9

Time / Day	9.00 am - 9.45 am	9.45 am - 10.30 am	10.30 am - 10.45 am	10.45 am - 11.30 am	11.30 am - 12.15 pm	12.15 pm - 1.00 pm	1.00 pm - 3.00 pm	3.00 pm - 4.00 pm
Monday	Mathematics	English		Thai Language	Science		Vocational	Sport
Tuesday	Mathematics	English		Thai Language	Social Study		Vocational	Sport
Wednesday	Mathematics	English		Science	Social Study		Vocational	Sport
Thursday	Mathematics	Social Study		Science	Thai Language		Vocational	Sport
Friday	Science	Social Study		Thai Language	English		Vocational	Sport

2. For Grade 10-12 (Upper Secondary Educational level)

Timetable for Grade 10-12 (Upper Secondary Education Level), Learning classes are in the morning before lunch time. Vocational classes are after lunch time followed by Sport. Vocational training classes are according to the students' choice as well as Sport. Sport hour is not an hour fixed, can be flexible according to students ability.

TABLE 3.2.4 TIMETABLE FOR GRADE 10-12

Time / Day	9.00 am - 9.45 am	9.45 am - 10.30 am	10.30 am - 10.45 am	10.45 am - 11.30 am	11.30 am - 12.15 pm	12.15 pm - 1.00 pm	1.00 pm - 3.00 pm	3.00 pm - 4.00 pm
Monday	Thai Language	Science		Mathematics	Social Study		Vocational	Sport
Tuesday	Thai Language	Science		Mathematics	English		Vocational	Sport
Wednesday	Thai Language	Science		Social Study	English		Vocational	Sport
Thursday	Thai Language	Social Study		English	Mathematics		Vocational	Sport
Friday	Social Study	English		Mathematics	Science		Vocational	Sport

3.2.2 User Timings

To study the user timing of the visual impairment children center, the center will be opened from 9:00 am – 4:00 pm (6 hours per day) while for the staff and teachers can start to come and prepare from 8:00 am – 6:30 pm. For service staff (cooks, housekeepers & security) works earlier that office staff, and security work for 24 hours with 8 hours per shift.

TABLE 3.2.1 USER TIMINGS

STUDENT TEACHER OFFICE STAFF SERVICE STAF VISITOR

Time / Area	6:00 a.m. - 8:00 a.m.	8:00 a.m. - 9:00 a.m.	9:00 a.m. - 10:30 a.m.	10:30 a.m. - 12:00 p.m.	12:00 p.m. - 1:00 p.m.	1:00 p.m. - 3:00 p.m.	3:00 p.m. - 5:00 p.m.	5:00 p.m. - 6:30 p.m.	6:30 p.m. - 8:30 p.m.	8:30 p.m. - 6:00 a.m.
Lobby										
Reception										
Teacher Office										
Staff Office										
Classrooms										
Workshop										
Training area										
Library										
Cafeteria										
Service Area										
Multi-purposes										
Sport area										

3.2.3 User Functions and Activities

The symbols provide an easier understand to the functions and activity of each area. There are 4 different zones; Public zone, Office zone, Educational zone, Facility zone and Sport zone.

Symbols

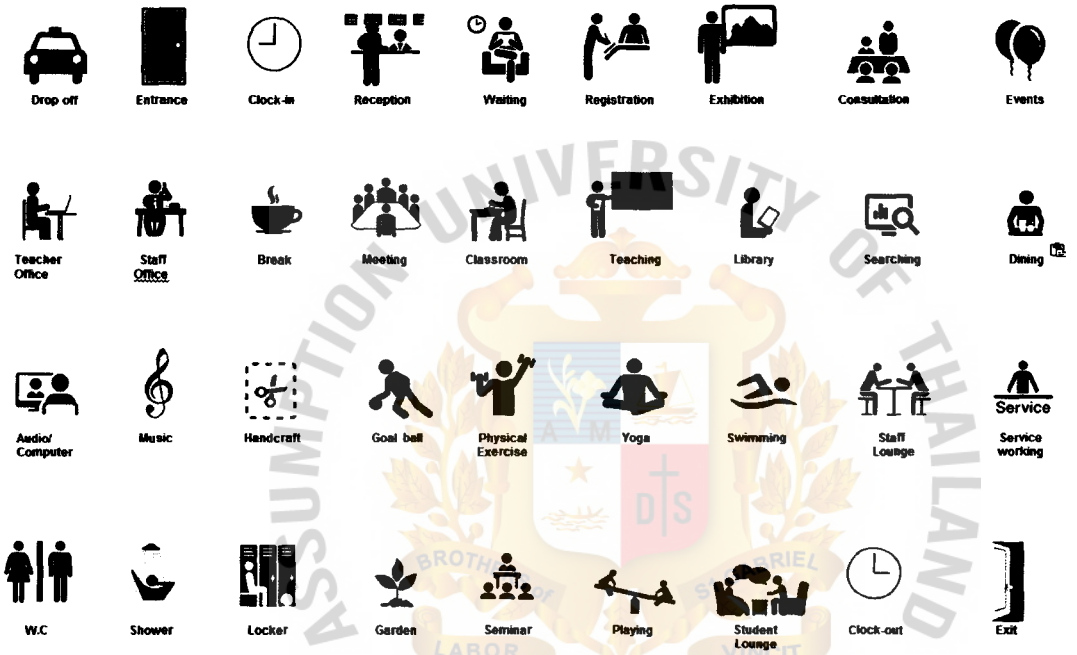


FIGURE 3.2.2 SYMBOLS

TABLE 3.2.5 USER FUNCTION AND ACTIVITY SEQUENCE

Area	Function	Activity
Public area	Lobby	 Drop 0ff Entrance Reception Waiting Exhibition
	Consultation area	 Waiting Consultation
	Multi-proposes area	 Events Meeting Seminar
Office area	Registration office	 Waiting Registration Consultation
	Teacher office	 Working (Teacher) Break Meeting
	Staff office	 Working (Staff) Break Meeting
	Staff area	 Break Changing

Educational area	Classroom	 Learning  Teaching
	Workshop (Vocational)	 Teaching  Music  Handcraft  Audio/ computer
	Library	 Reading  Searching Information
Facility area	Cafeteria	 Dining  Break
	Play area	 Playing  Garden
	W.C Shower	 W.C  Shower  Changing
Sport area	Indoor sport (Physical exercise, Yoga, so no.)	 Physical Exercise  Yoga  Changing
	Outdoor sport (Goal ball, swimming)	 Goal ball  Swimming  Changing

3.2.4 User Behavior & Circulations

There are four types of users; Student, Teacher, Staff (Service and Office) and Visitors.

Student

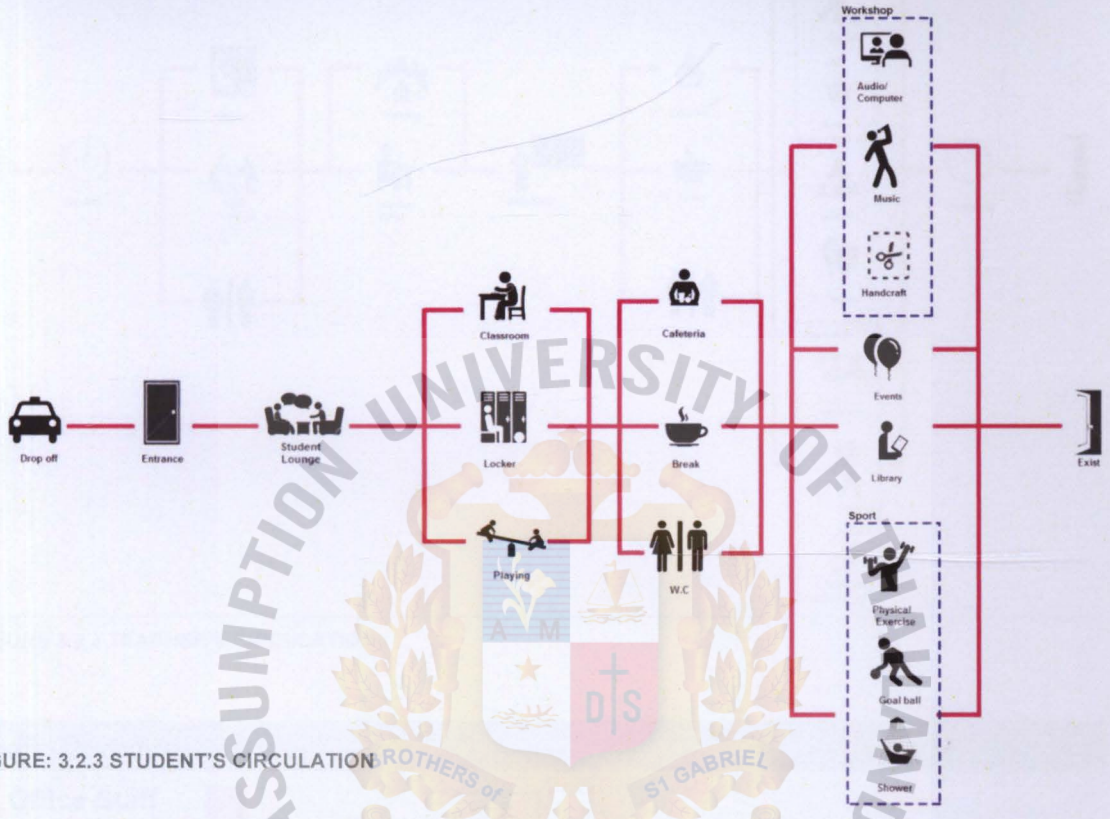


FIGURE: 3.2.3 STUDENT'S CIRCULATION

Visitor

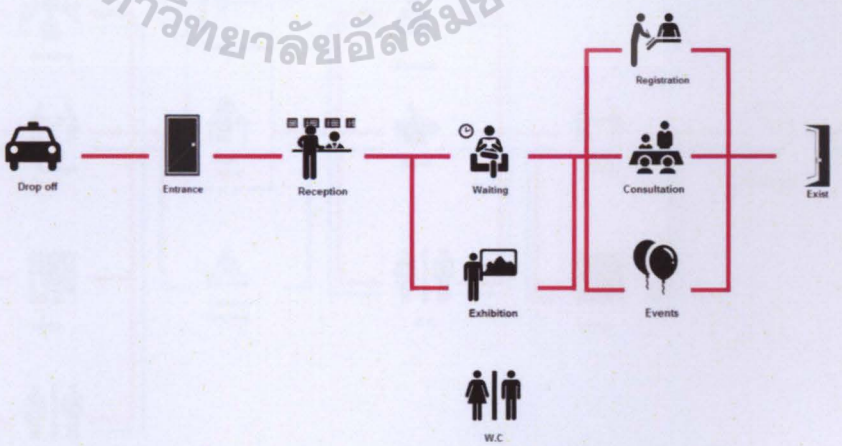


FIGURE: 3.2.4 VISITOR'S CIRCULATION

Teacher

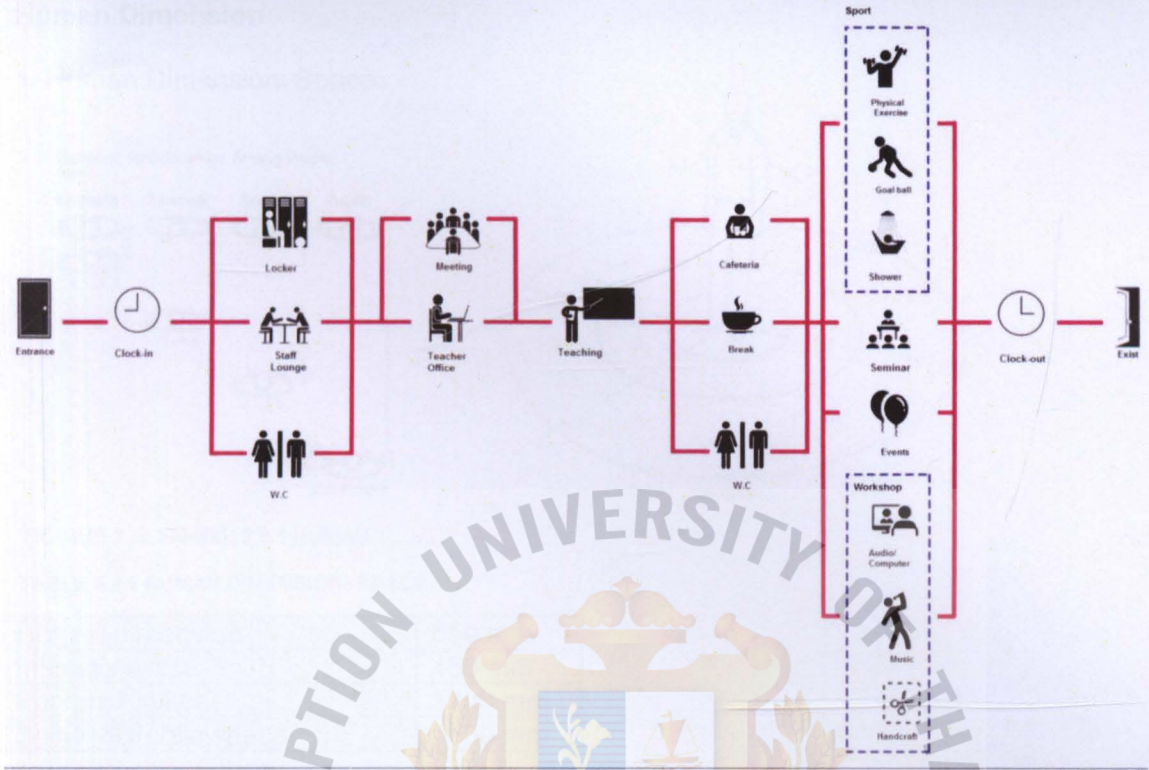


FIGURE 3.2.5 TEACHER'S CIRCULATION

Staff: Office and Service

- **Office Staff**
- **Service Staff**

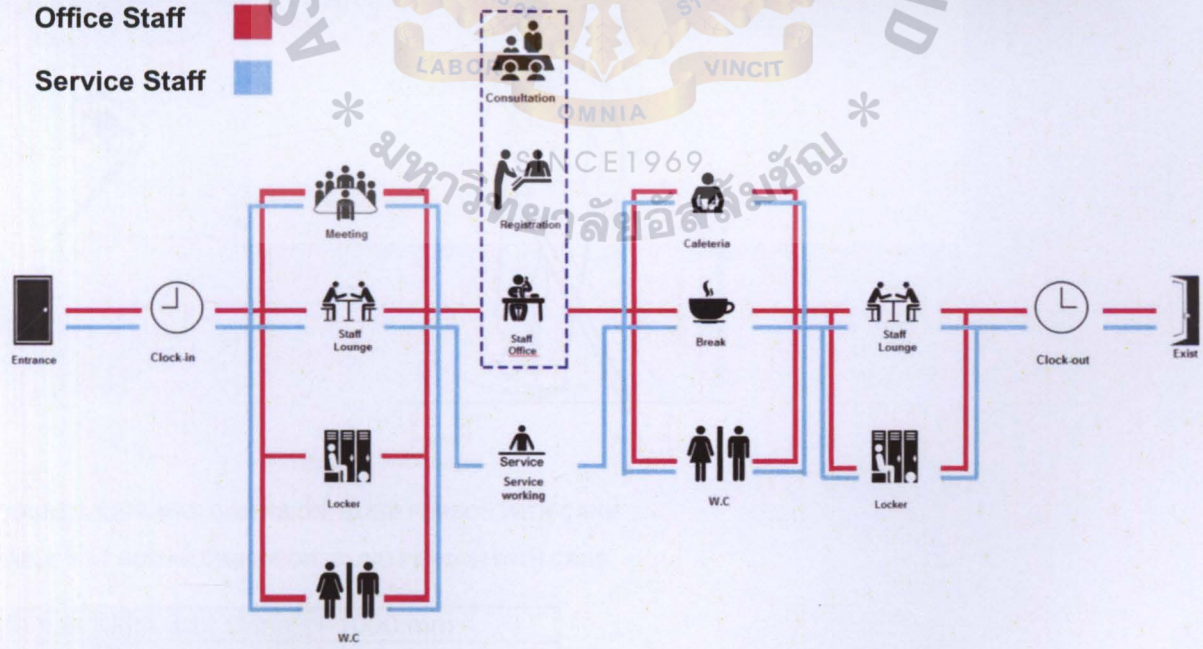
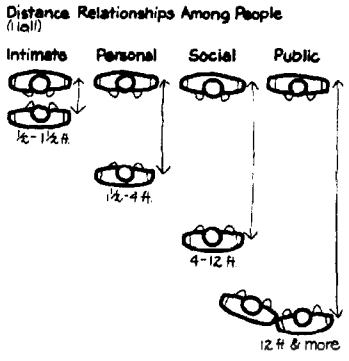


FIGURE: 3 .2.6 STAFF's CIRCULATION

3.3.1 Physical Needs

Human Dimension

1. Human Dimension: Space



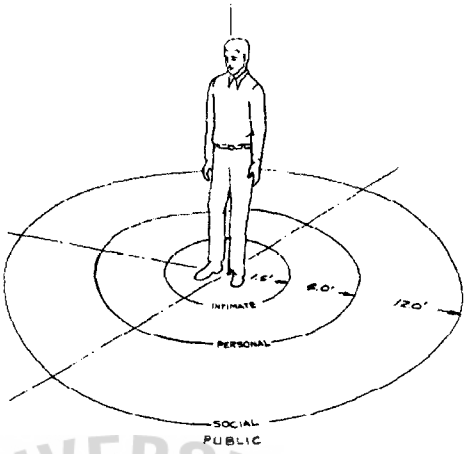


FIGURE: 3 .2. FIGURE 3.3.1 HUMAN

TABLE 3.3.1 HUMAN DIMENSION: SPACE

Human dimension	650 mm
Intimate space	450 mm
Personal space	1200 mm
Social & Public space	3600 mm

2. Blind Person with Cane

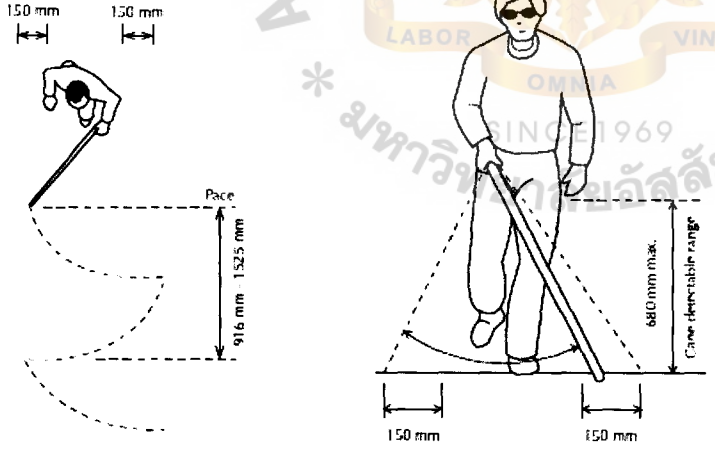


FIGURE 3.3.2 HUMAN DIMENSION: BLIND PERSON WITH CANE

TABLE 3.3.2 HUMAN DIMENSION: BLIND PERSON WITH CANE

Human width with Cane	1000 mm
Forward Pace for Cane	916- 1525 mm
Cane clearance range	680 mm

3. Routes

- Ensure that all temporary barriers and hoardings, used to protect work sites or maintenance activities, are substantial, securely mounted, continue to floor level and are cane detectable.
- Vertical clearance height for cane: 685 mm
- Clearance for blind people with guided dog : minimum 1100 mm

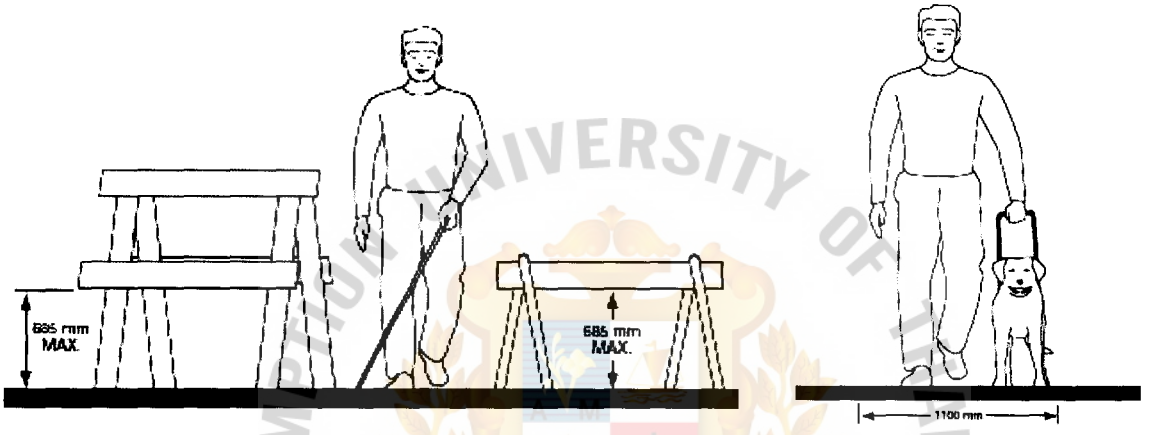


FIGURE 3.3.3 ROUTE FOR PERSON WITH CANE

4. Wheelchair

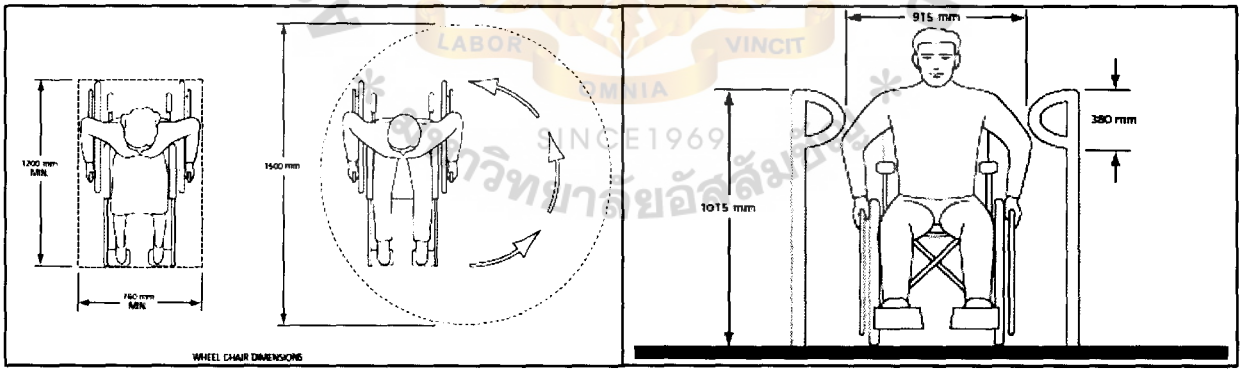


FIGURE 3.3.4 WHEELCHAIR DIMENSION

TABLE 3.3.3 WHEELCHAIR DIMENSION

Weight: at least	600 mm
Length:	1200 mm
Height:	1015 mm
Clearance for wheelchair:	1500 mm

5. Human Factor: Teenager (10- 15)

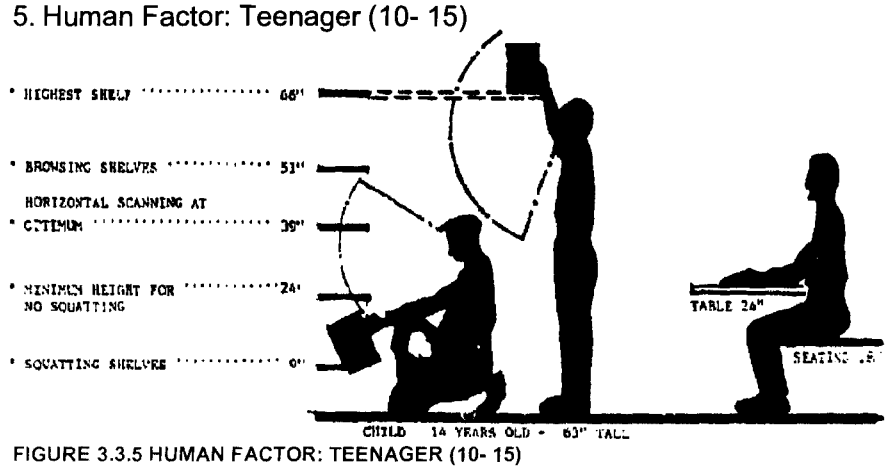


FIGURE 3.3.5 HUMAN FACTOR: TEENAGER (10- 15)

TABLE 3.3.4 HUMAN FACTOR: TEENAGER (10- 15)

Teenager shoulder width	650 mm
Teenager height	1575 mm
Seating height	400-450 mm
Table height	600 mm
Reaching height	1650 mm

6. Human Factor: Teenager (15- 18)

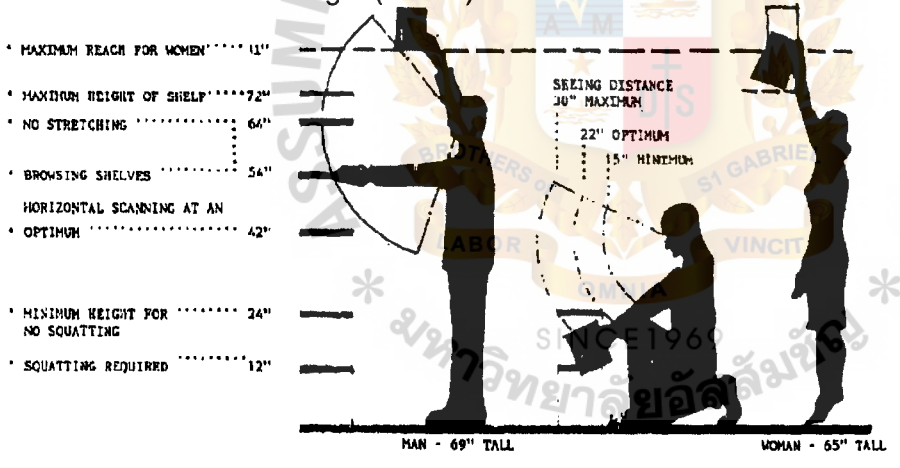


FIGURE 3.3.6 HUMAN FACTOR: TEENAGER (15- 18)

TABLE 3.3.5 HUMAN FACTOR: TEENAGER (15- 18)

Teenager shoulder width	650 mm
Teenager height • (female) • (male)	 1625 mm 1725 mm
Seating height	450 mm
Table height	750 mm
Reaching height • (female) • (male)	 1800 mm 2025 mm

7. Entrances

- Vestibule/Foyer depths should provide at least 1200 mm floor space
- Front doors should be a highly contrasting and textured surface (or mat) at grade and painted in a color that contrasts with the door surround and the surrounding wall

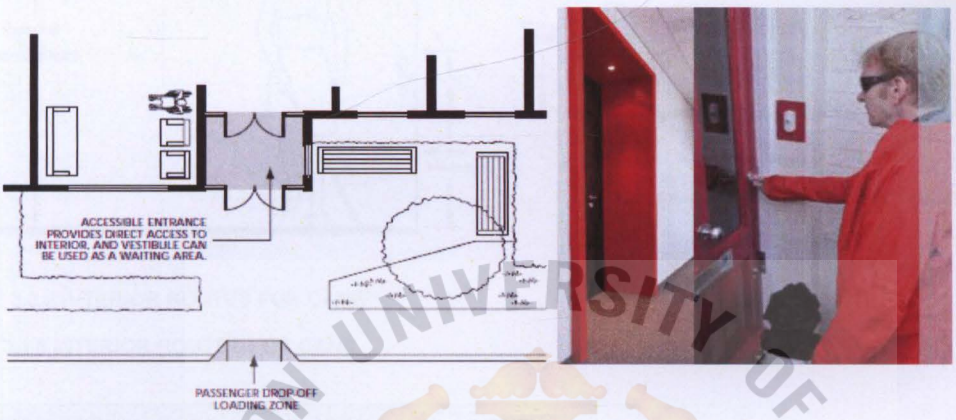


FIGURE 3.3.7 ENTRANCES

8. Doors and Doorways

- Main entrance doors and exist doors: minimum 915 mm
- Minimum headroom clearance: 2750 -3555 mm
- Suitable guards in a minimum of 305 mm beyond the door swing should be provided as an aid to persons with visual limitations.
- Out-swinging doors must be closed to preserve privacy an additional pull.
- Sliding door width: minimum 860 mm

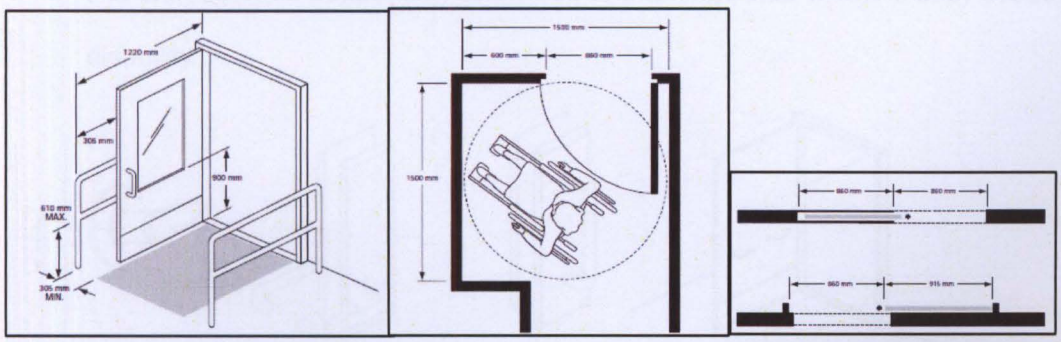


FIGURE 3.3.8 DOORS & DOORWAYS

9. Interior Routes

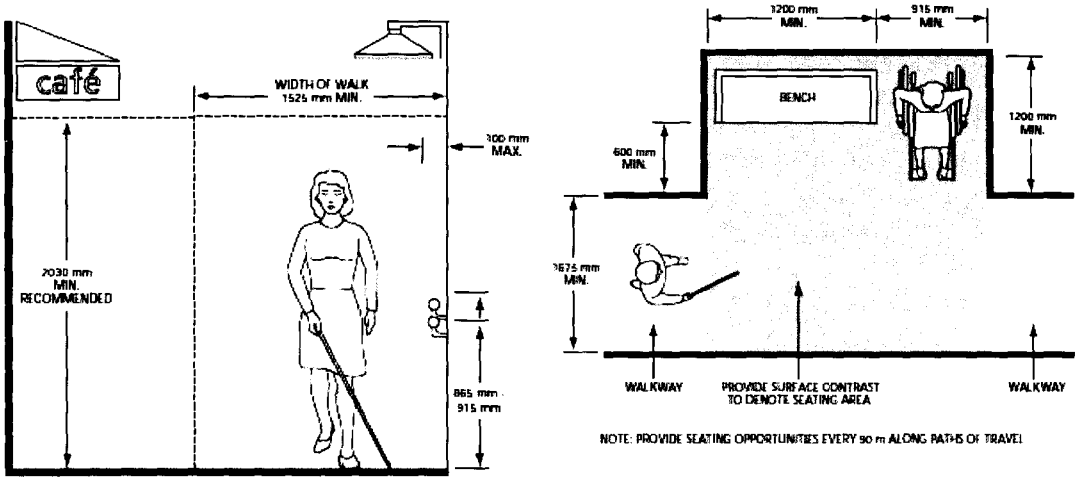


FIGURE 3.3.9 INTERIOR ROUTES FOR CANE

TABLE 3.3.6 INTERIOR ROUTES FOR CANE

Walkway for blind people with cane	1675 mm
Vertical clearance height	2030 mm
Space for Wheelchair	915x 1200 mm

10. Doors handle

- Push button: 150 mm diameter
- Door pulls or latches 'D' type
- Grasp handle: 75 mm - 100 mm
- Door locks mounted height: 760 mm -1065 mm
- Handle, mounted horizontally and close to the hinge side which is easy access for disability

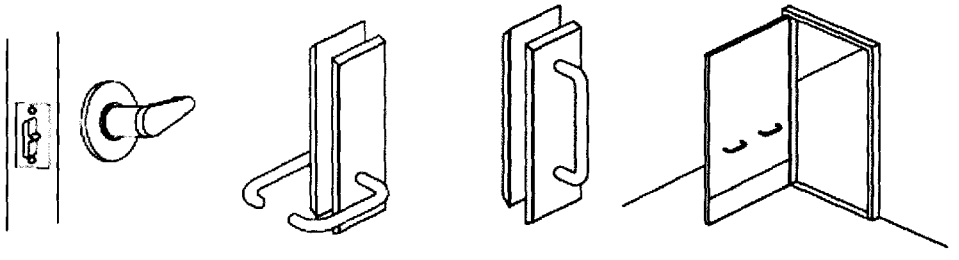


FIGURE 3.3.10 DOOR HANDLE

11. Interior Routes

- All vestibules, corridors, or aisle widths : minimum 1200 mm
- Wheelchair: at least 600 mm
- Corridors serving residential suites: minimum of 1100 mm
- Turning locations should not be greater than 30 m apart and are recommended at ends of corridors

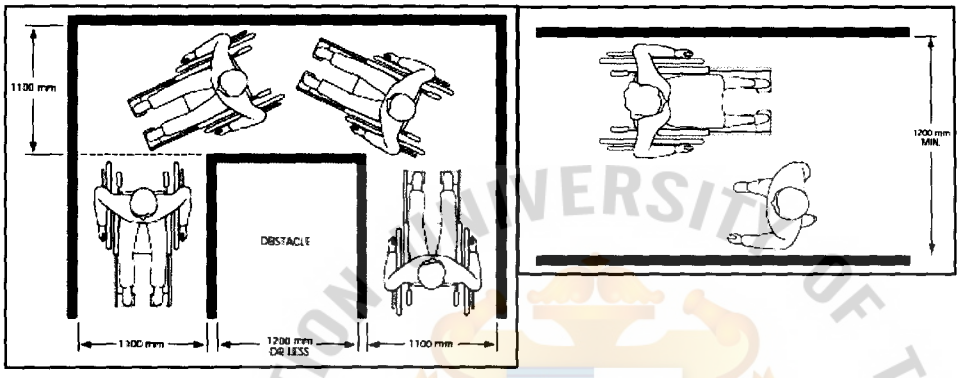


FIGURE 3.3.11 INTERIOR ROUTES FOR WHEELCHAIR

12. Elevator

- Controls/buttons should include tactile information to ensure easy use by persons who have visual limitations
- Elevator access to a stretcher: 1725 mm x 2285 mm
- Individual platform lifts: 1065 mm x 1370 mm

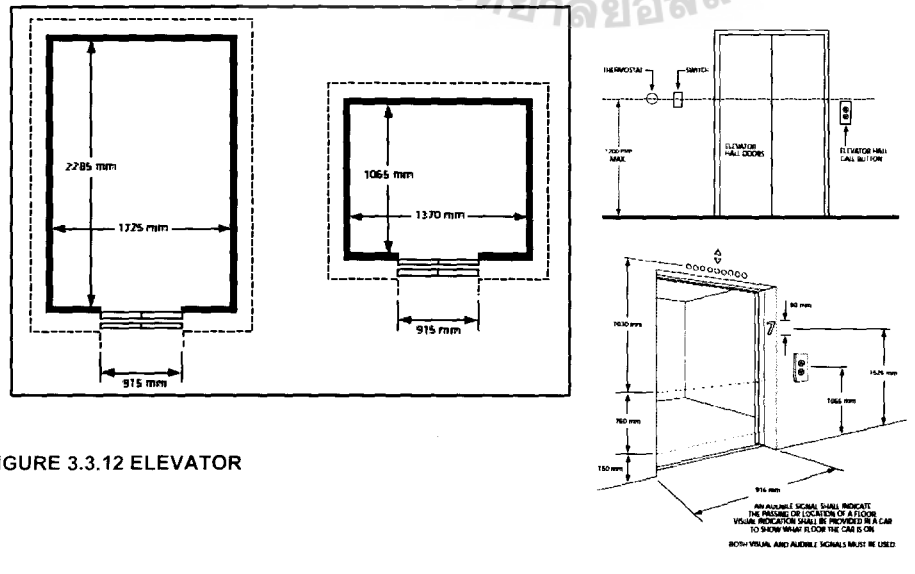


FIGURE 3.3.12 ELEVATOR

13. Ramps

- Ramp must be no steeper than 1:12, with individual ramp sections no longer than 9m
- The width of ramp between handrails: minimum 1500 mm
- Landing Between ramps width: 1200 mm-1500 mm
- Up-stand curb: 300 mm-600 mm
- Handrails height: 865 mm- 965 mm
- Handrails extend: minimum 300 mm

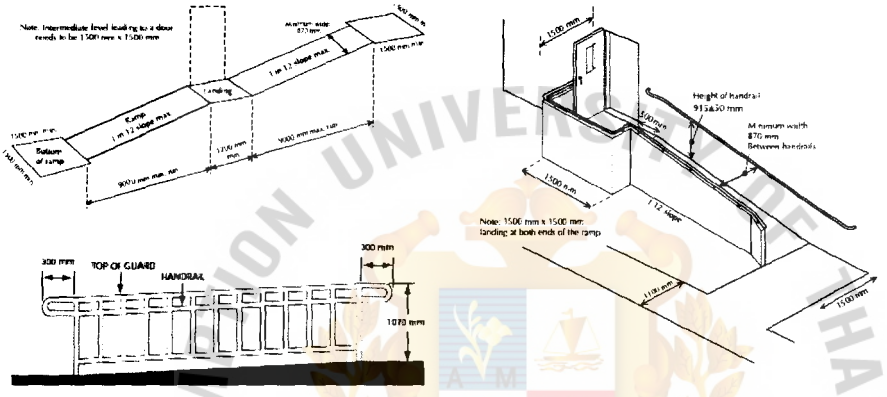


FIGURE 3.3.13 RAMPS

14. Stair

- Width of stair: minimum 1500 mm, maximum rise and tread: 180 mm and 280 mm
- Tread nosing should be clearly marked with either a brightly painted non-slip finish and/or include an integrated non-slip nosing that clearly contrasts in tone/color from the tread. Firm and non-slip materials
- Handrails should be provided on both sides with contrasted color.
- Clearance of handrail from wall: minimum 40 mm

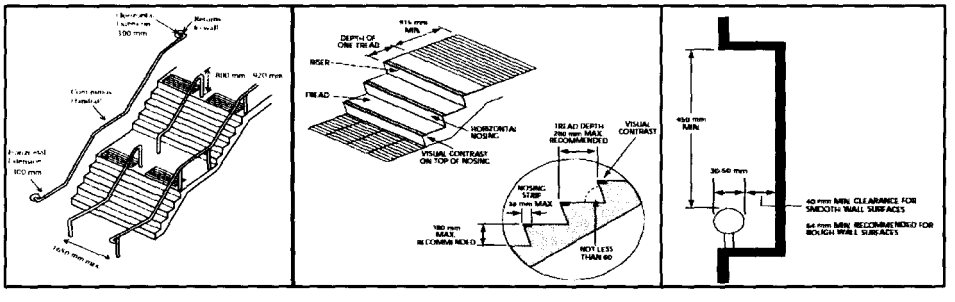


FIGURE 3.3.14 STAIRS

15. Lobby

Reception counter

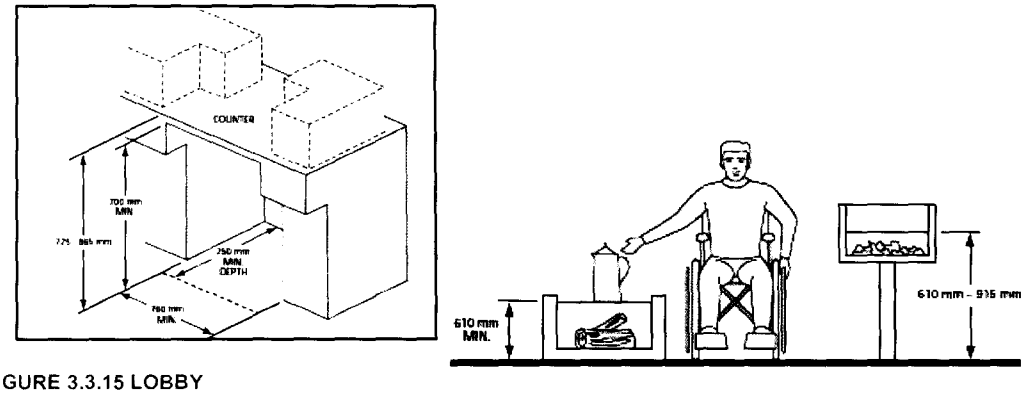


FIGURE 3.3.15 LOBBY

TABLE 3.3.7 LOBBY

Counters height used for persons in wheelchairs	700 mm - 865 mm
Accessible counters width: minimum	760 mm
Knee space clearance depth:	250 mm
Waiting area: Coffee and telephone tables height	510 mm

16. Library

- Aisles wide: 915 mm -1065 mm
- Study tables height with clear knee space: minimum 700 mm
- Tables: not lower than 460 mm & not higher than 1220 mm
- Grasp reach length: no more than 510 mm, counter: 800 mm - 1000 mm
- Acoustic quality in library, reading and study areas should limit.

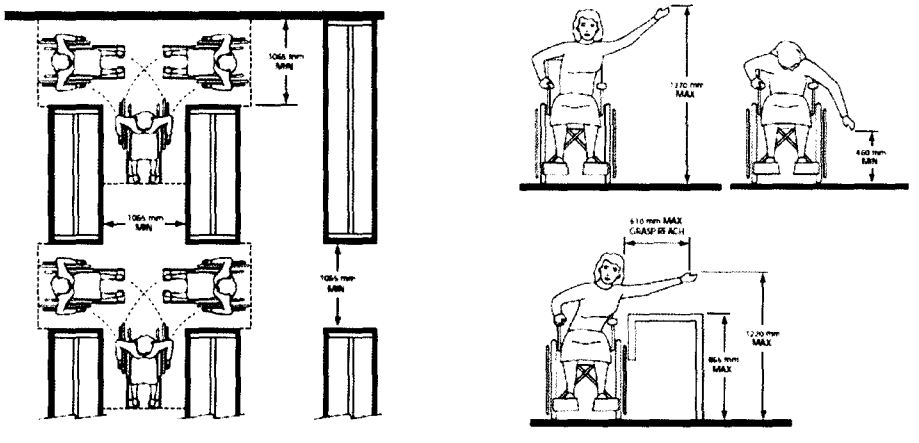


FIGURE 3.3.16 LIBRARY

17. Classroom

- Free of visual and physical clutter
- Avoid excessive furniture, materials and equipment
- The seating in the classroom will depend on the functional vision of the student.
- Avoid the teacher and teaching board directly in front of a window or light source when teaching. A student with a visual impairment should not face direct light from windows or lighting.
- The space should be sound proof from the outside as hearing is one of the important senses that visual impaired students used for communication.
- Clearance circulation: minimum 1200 mm
- Table height: 800 mm

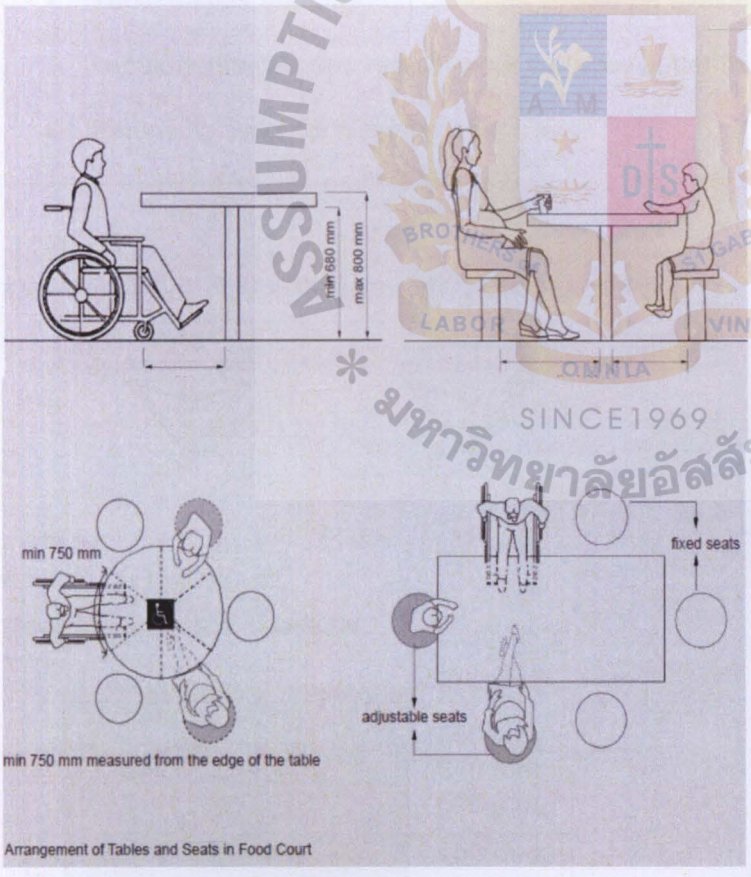


FIGURE 3.3.17 CLASSROOM

18. Art Room

- Having scents and texture in the material such as paints and dough or paste can give a better and easier understanding to the lessons well as memorizing the materials.
- Also having interpolators to descript the class information.
- Introduce materials on trays with contrasting color.
- Organize tools and materials in the same place such as paints, brushes and supports or clay and tools for easily accessed.
- Sinks for cleaning after class.
- Storage within the room would be for student projects.[18]

18.1 Drawing and Painting Classroom

- Table easels and drawing benches should be available to students with certain vision impairments can see vertical work surfaces better than horizontal ones.
- Peninsula sinks for cleaning after class.

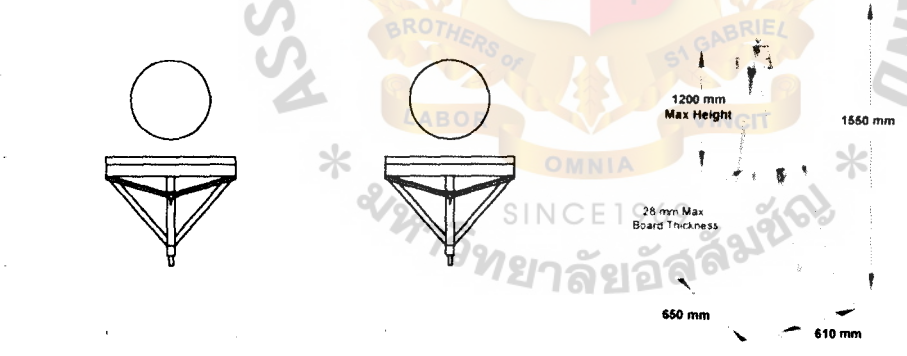


FIGURE 3.3.18 TABLE EASEL

TABLE 3.3.8 ART ROOM DIMENSION

Easels : • **Height** • **Width** • **Depth**	 1550 mm 610 mm 650 mm
Distance between each easels	750 mm

[18] "Art Therapy Program for Children and Adults with Visual Impairments," Art Beyond Sight, accessed October 15,2015, http://www.artbeyondsight.org/handbook/az-art-therapy-program.shtml. (no author)

18.2 Ceramic Art Room

- For hand craft class, must have a tutor or teacher to introduce a model and guide the students' hands to progress the class.
- The table should be large enough with adequate workspaces which are more comfortable to explore materials and create art.
- Peninsula sinks for cleaning after class.
- There are four main area required for ceramic clay art; Ceramics Rooms, Wheel Room, Glazing Room and Kiln Room.

TABLE 3.3.9 WHEEL TABLE DIMENSION

Wheel table:	
• Diameter	460 mm
• Depth	580 mm
• Height	510 mm

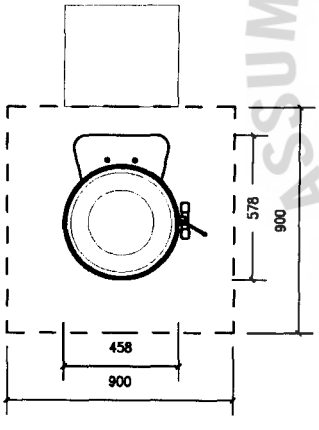


FIGURE 3.3.19 WHEEL TABLE DIMENSION

19. Computer Room

- As the students are legally blind, the computer system is not only with the braille keyboard but also have a voice recorder and voice receipted to provide information.
- Headphones are provided in each computer station.
- The computer station must have a low partition to avoid glare and also disturbs from the surrounding.
- Computer stations with specialty software would be set up around the perimeter of the room.
- A projector area would be provided along one of the walls for display and instruction.

TABLE 3.3.10 COMPUTER STATION DIMENSION

Computer Station • Width • Length • Height • Height of the partition	600 mm 1000mm 750 mm 800 mm

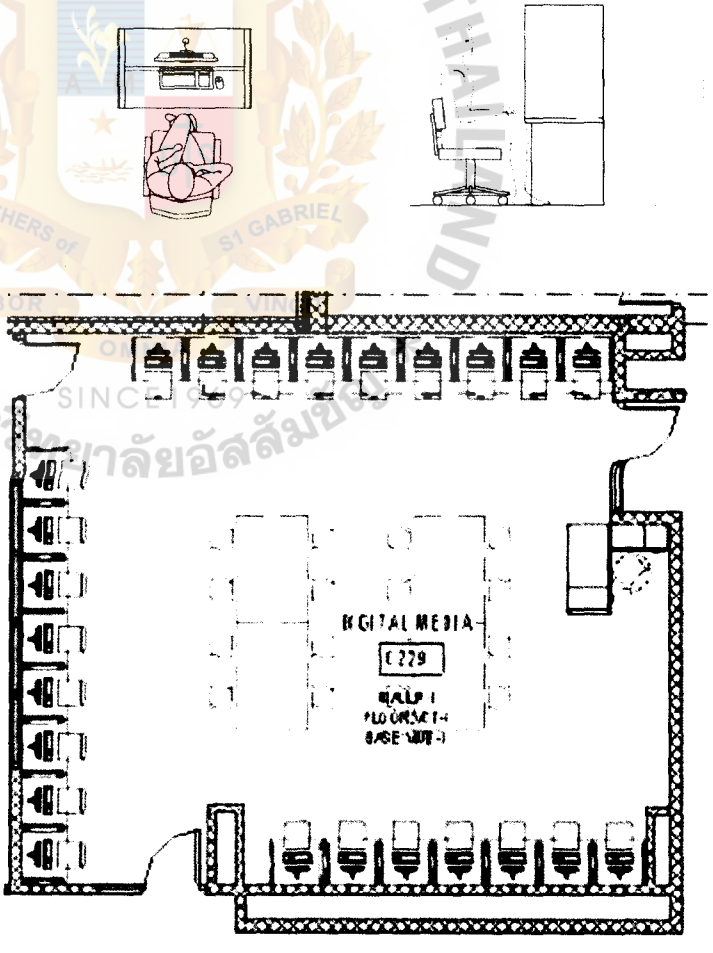


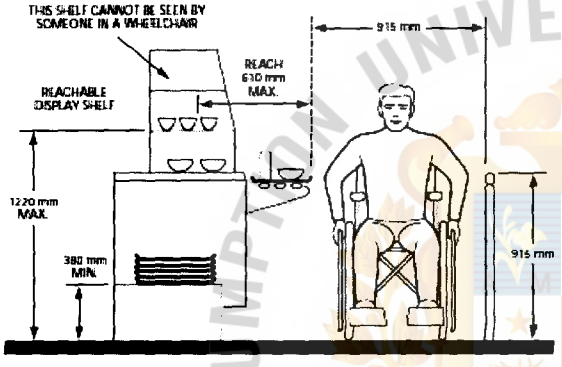
FIGURE 3.3.20 COMPUTER ROOM

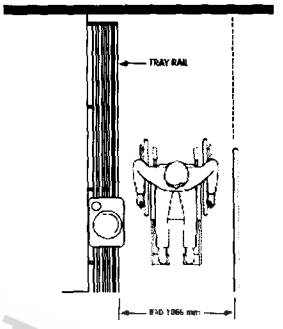
20. Cafeterias/ Dining Areas

- Aisle spaces between furniture, equipment or other fixed objects should be wide enough to allow a person using mobility aids to pass.

TABLE 3.3.11 CAFETERIA FOOD COUNTER DIMENSION

Major aisles	810 mm - 1065 mm
Counter service; • Counter height • Counter depth	 915 mm 760 mm
Overhead shelves reach	no higher than 1220 mm





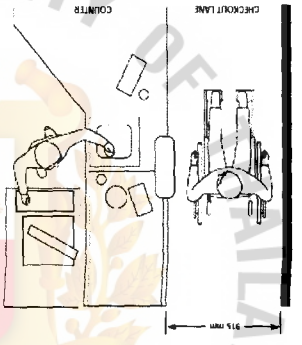


FIGURE 3.3.21 CAFETERIA FOOD COUNTER

21. Cafeterias/ Dining Areas

- Two in every ten tables are to be accessible to wheelchairs, or a minimum of at least 2 tables are to be accessible to wheelchairs.
- Only 50% of the seats at such tables are to be fixed. The remaining seats are to be adjustable.

TABLE 3.3.12 CAFETERIA SEATING

Major aisles:	810 mm - 1065 mm
Clearance circulation: minimum	1200 mm
Loose seating, chairs or benches height	405 mm - 460 mm
Tables height: maximum	785 mm
Clear knee space height	700 mm
Clear knee space wide: minimum	760 mm

22. Public Washrooms

Lavatories

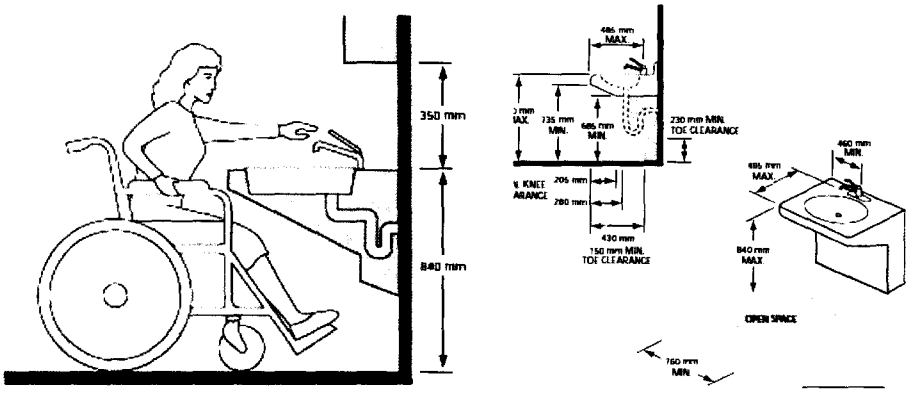


FIGURE 3.3.22 LAVATORIES

TABLE 3.3.13 LAVATORIES

Knee space sink counter	735 mm
Sink counter width	760 mm
Edge of the counter depth	205 mm

23. Public Washrooms

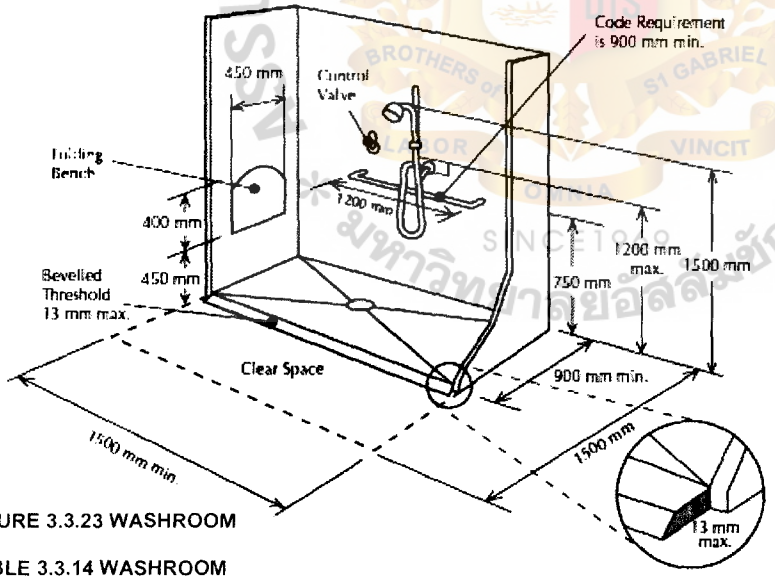


FIGURE 3.3.23 WASHROOM

TABLE 3.3.14 WASHROOM

Shower stalls one unit	1500 mm x 900 mm
Beveled threshold	no higher than 13 mm.
Accessible showers with a drop down seat height from the floor	438 mm - 480 mm
A horizontal grab rail from the floor	915 mm

24. Public Washrooms: Toilet

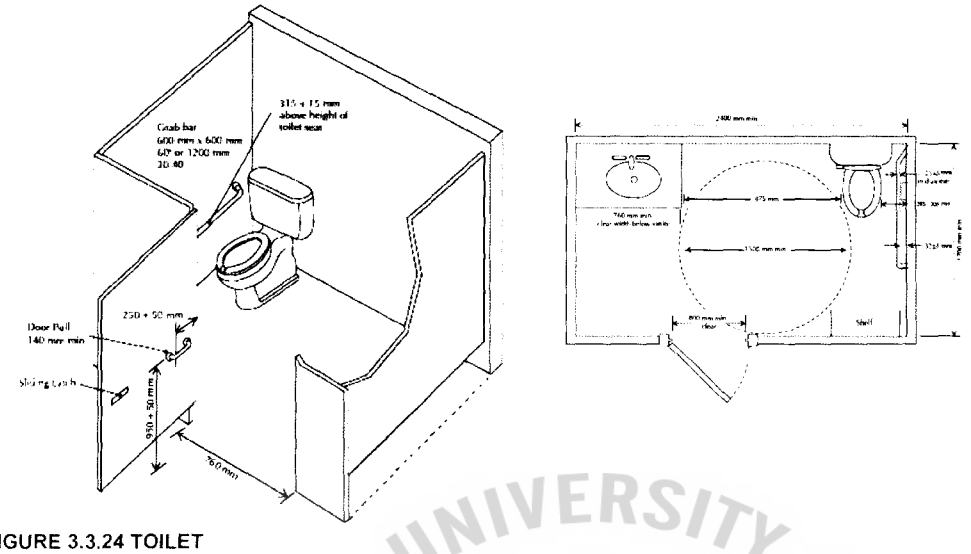


FIGURE 3.3.24 TOILET

TABLE 3.3.15 TOILET

Toilet compartment	minimum 950 mm x1500 mm
Accessible toilet room	minimum 1500 mm - 2000 mm

25. Grab bar

- L-shaped grab bars should be provided on both sides of the water closet
- Grab bars mounted height: 280 mm - 300 mm
- Grab bar distance from the center urinal: 380 mm

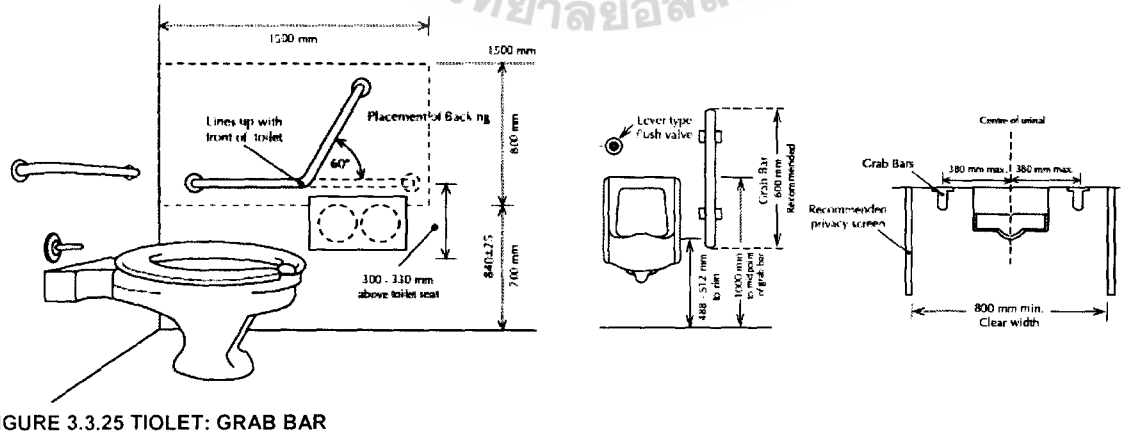


FIGURE 3.3.25 TIOLET: GRAB BAR

26. Activity area: Pool

- Swimming pools should be generally of 'level-deck' design to allow easy entry and exit to the pool.
- Stand up edge is provided around the perimeter of the pool: Height: 205 – 405 mm.
- The top edge width (seating): minimum 305 mm
- Pool depth markings as well as 'SHALLOW END' and 'DEEP END' signage in highly contrasting colors and sufficient size for easy visible to persons with low vision.
- Pool boundaries should be a textural change and be of a bright color or sharp contrast to both the water surface and the surrounding paving as an aid to persons with visual limitations.
- All materials and finishes used on the pool perimeter, on the deck or on paved areas surrounding the pool, should be of firm, non-slip materials.

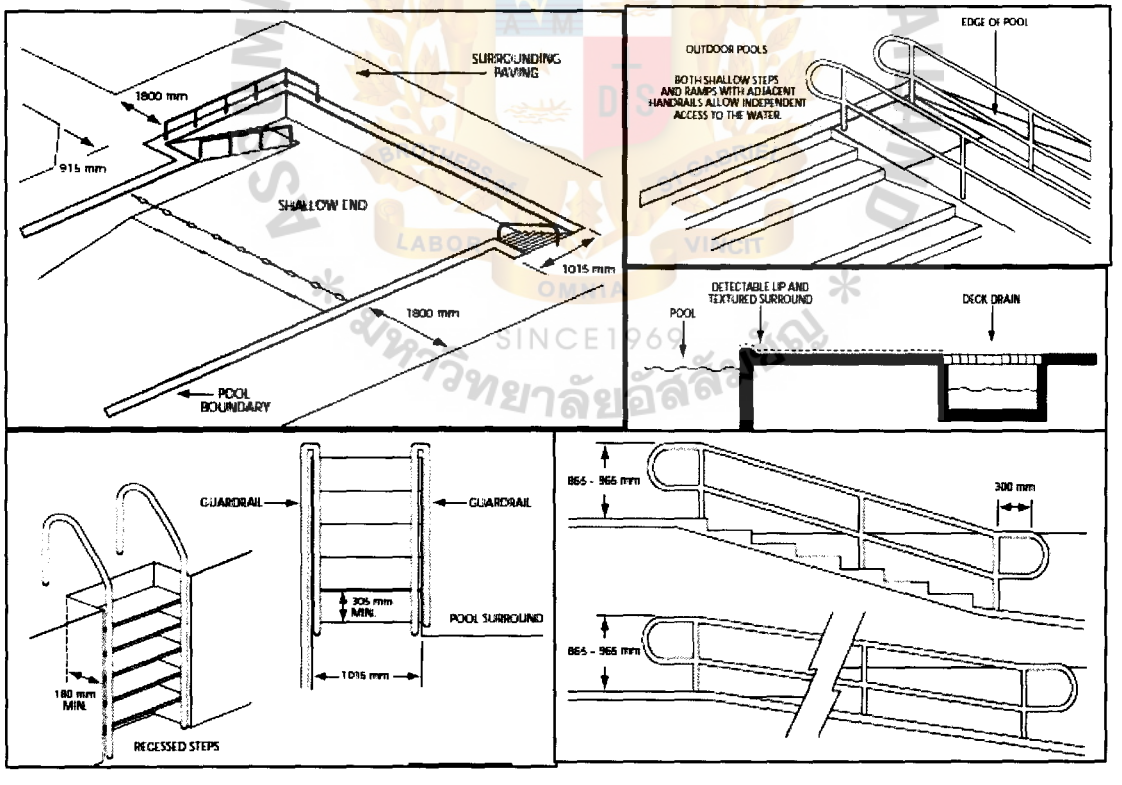


FIGURE 3.3.26 SWIMMING POOL

27. Activity area: Play area

- Play areas and recreational equipment, or other amenities should generally be designed to be accessible to and useable by children with varying abilities disabilities.
- Benches and seating areas should be accessible to a variety of users.
- The use of raised beds, fragrant planting materials, and Braille signage as an added value to persons who have visual limitations.
- The floor or paving should be in non-slip material.

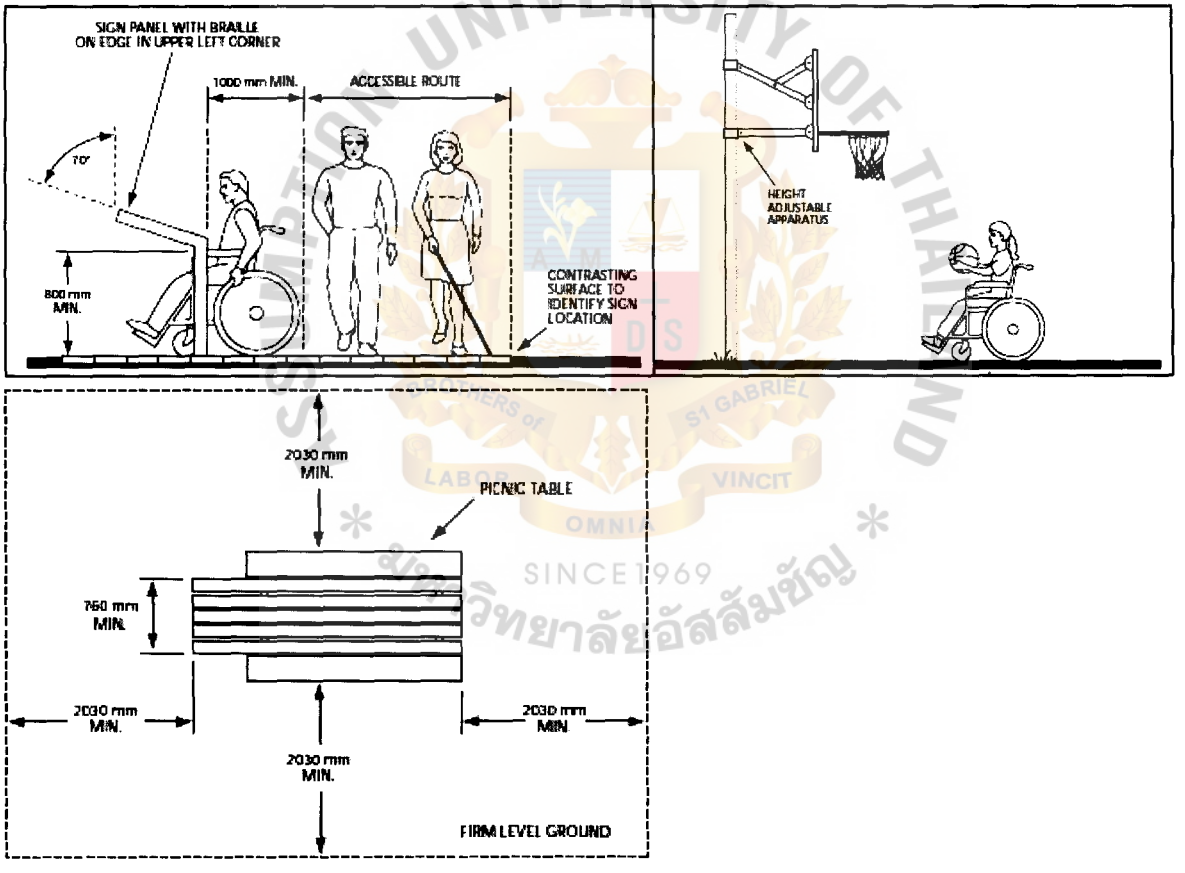


FIGURE 3.3.27 OUTDOOR ACTIVITY AREA

Lighting

The three principle light sources are;

- Natural light
- Incandescent
- Florescent

Natural light

Use of natural light is always a priority for interior designers and is especially significant when designing for people with sight loss. To this end, curtain poles and tracks should be fitted so that the curtains let in the maximum amount of daylight when pulled back. Vertical blinds are also a useful way of controlling the amount of daylight coming in to a room. Curtains and blinds should be easy to operate.

Artificial light

When installing artificial light, a combination of general (ambient) and task lighting will provide depth and warmth and ensure that the room feels homely. A good overall level of ambient lighting will minimize dark corners and shadows and an even and consistent level of *light will make* moving from room to room easier and safer. Task lighting is essential for focused activities and to illuminate the inside of cupboards or wardrobes. Given the variety of eye conditions, it is important to ensure that as much of the lighting as possible is dimmable and that it is switched and controlled separately to allow for individuals to adjust it on their own comfort. Specifying plenty of sockets will enable floor and table lamps to be moved to suit the needs of the person using the room and avoid trailing wires which might present a trip hazard.

- Appropriate for the individual
- Sufficient for tasks, orientation and movement
- Even and consistent across different areas, with minimum glare
- Adjustable for flexibility
- Energy efficient and sustainable
- Simple to install, minimizing disruption

TABLE 3.3.16 RECOMMENDED LUX LEVELS ON THE FLOOR [19]

Area	Lux for people with Sight Loss
Hallway	**100 – 300**
Lounge/Dining	100 – 300
Kitchen	**200 – 300**
Bathroom	100 – 300
Bedroom	**100 - 300**
Stairs (on treads)	100 - 200
Corridors	**100 - 200**

TABLE 3.3.17 RECOMMENDED LUX LEVELS FOR SPECIFIC ACTIVITIES

Task definition	Examples of activity	Lux
Routine	**Showering/bathing/ washing**	**100 - 300**
	Brushing teeth	200 - 300
	Finding keys	**100 - 300**
Time-consuming	Reading/writing	200 - 1000
	Washing up or having a meal	**200 - 500**
Short and detailed	Selecting clothes (wardrobe/drawer)	100 – 200
	Using the telephone	**100 - 400**
	Putting on shoes	100 - 300
Requiring concentration and with risk	**Cooking or making a cup of tea**	**200 - 1000**
	Shaving	200 - 1000

[19] Jacqui Smith, *Homes and living spaces for people with sight loss: A guide for interior designers* (London: Thomas Pocklington Trust, October 2014), 19.

Signage

- Signage and way-finding strategies must be logical, consistent in design and distribution throughout the building.
- Should be at eye-level: 1370 mm - 1525 mm high and 305 mm from the side of doorframe.
- Lettering for sign should not be smaller than 25 mm high.
- In a highly contrasting color, compared to the background color.
- Braille should be located immediately below numbers and names, as well as any major directional signs.
- A tactile map is used to show the location of area in the main entrance lobby.

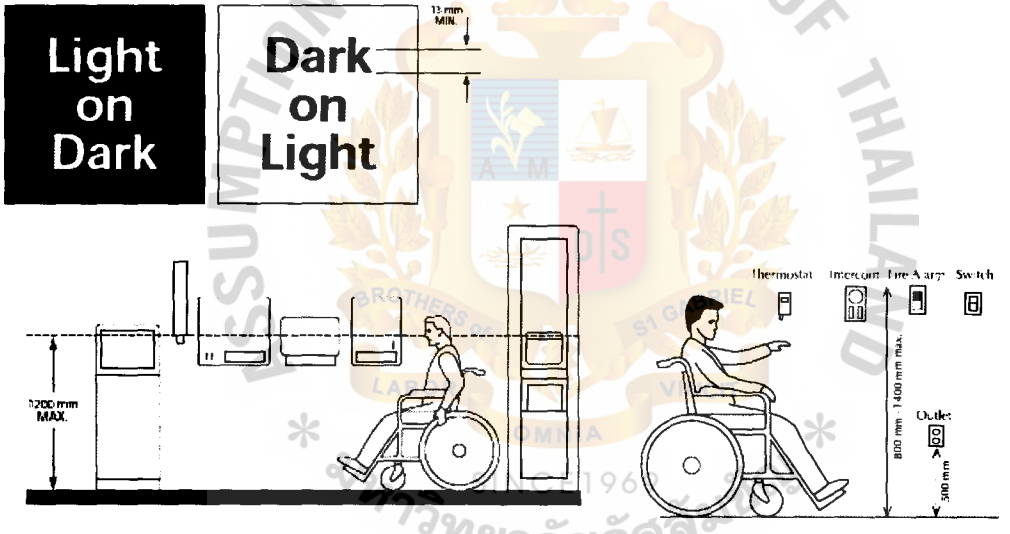


FIGURE 3.3.28 SIGNAGE

Signage & Raised Graphic

- For exiting and fire alarm signage
- For signage relating to elevators
- For signage relating to restrooms

FIGURE 3.3.29 GRAPHIC SIGNAGE

3.3.2 Psychological Needs

Human Psychological Needs:

The human psychological needs of each user are taken by research and questionnaires.

TABLE 3.3.18 HUMAN PSYCHOLOGICAL NEEDS

User	Persons	Psychological needs
Student		• Safety • Avoid unfamiliar and crowded space • Comfortable and Friendly • School atmosphere • Warm and comfortable • Clear sense of orientation • Natural light
Visitor	• Parents of Student • Visitor for information • Volunteers	• Hospitality • Relax and Comfortable • Good on services • Informative
Teacher	• Education • Vocation • Sport • O & M (Orientation & Mobility)	• Functional Plan • Bright and Clean Space • Comfortable • Coordinative atmosphere • Adequate teaching tools and equipment
Staff: Reception	• Receptionists • Registration Officers	• Bright and Clean Space • Comfortable • Serviceability • Accessibility
Staff: Office	• Administration officers • Management officers	• Functional Plan • Physical security and Hygienic safety • Sufficient light

		• Good orientation and atmosphere • Coordinative atmosphere
Staff: **Service**	• Maintenance • Housekeeping • Kitchen Staff • Security Staff	• Functional Plan • Physical security and Hygienic safety • Sufficient light • Good orientation and atmosphere • Coordinative atmosphere

3.4 Functions and Facility Studies

3.4.1 Functions and Facility Studies

Student ● Staff

Teacher ● Visitor

TABLE 3.4.1 FUNCTIONS AND FACILITY STUDY: LOBBY

Area	Function	Type of User			
		Student	Visitor	Teacher	Staff
Lobby	Reception	●	●	●	●
	Waiting area		●		
	Registration area		●		●
	Consulting area		●	●	●

TABLE 3.4.2 FUNCTIONS AND FACILITY STUDY: LEARNING AREA

Area	Function	Type of User			
		Student	Visitor	Teacher	Staff
Learning area	Classroom	●		●	
	Workshop (Vocational)	●		●	
	Training (O&M)	●		●	
	Sport	●		●	

TABLE 3.4.3 FUNCTIONS AND FACILITY STUDY: OFFICE AREA

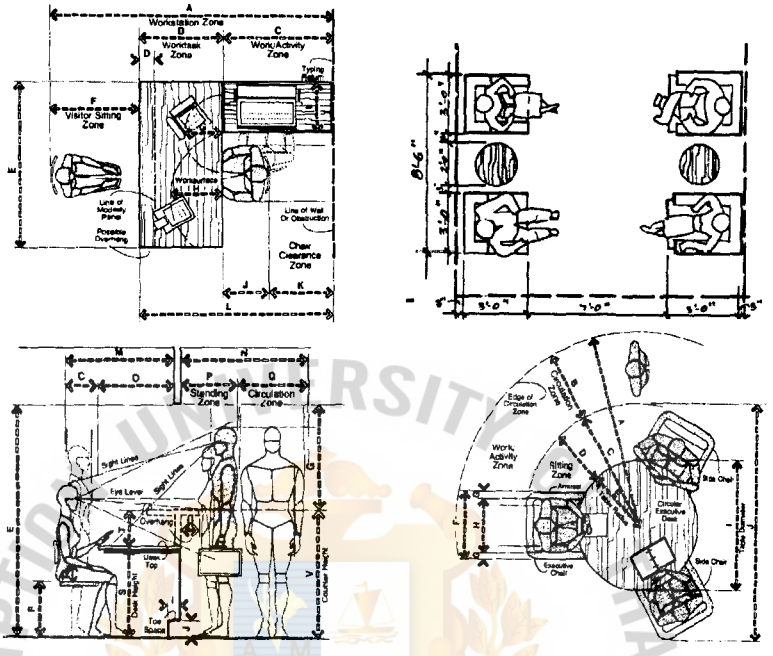
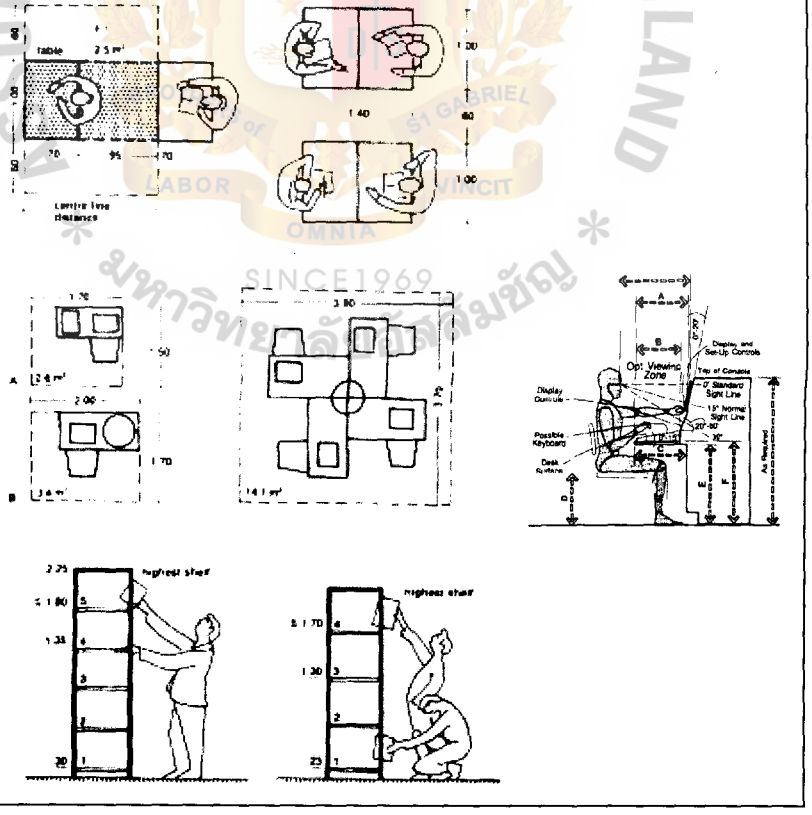
Area	Function	Type of User			
		Student	Visitor	Teacher	Staff
Office area	Clock In/Out			●	●
	Staff lounge			●	●
	Teacher office			●	
	Staff office				●
	Meeting room			●	●
	Locker				●
	Service working area				●

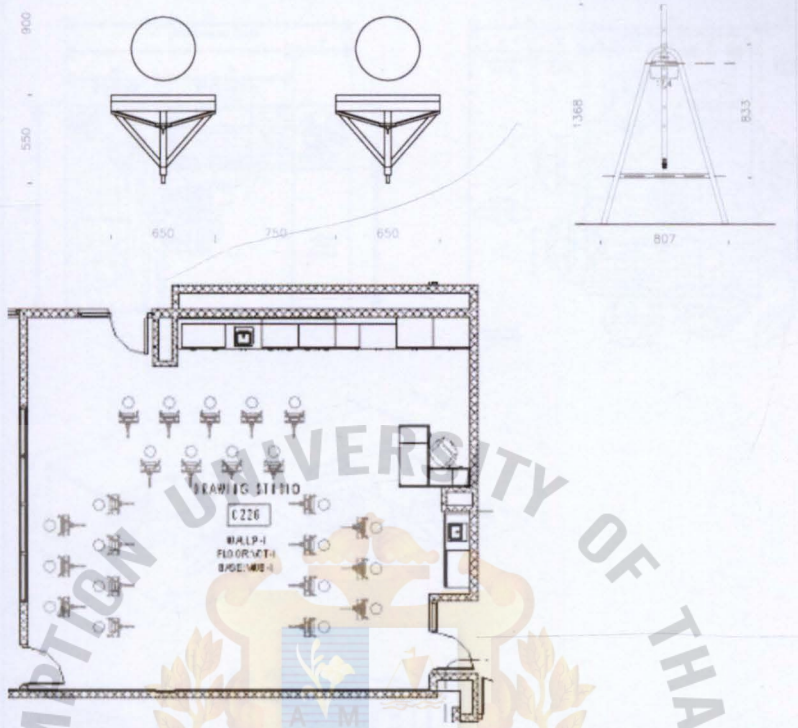
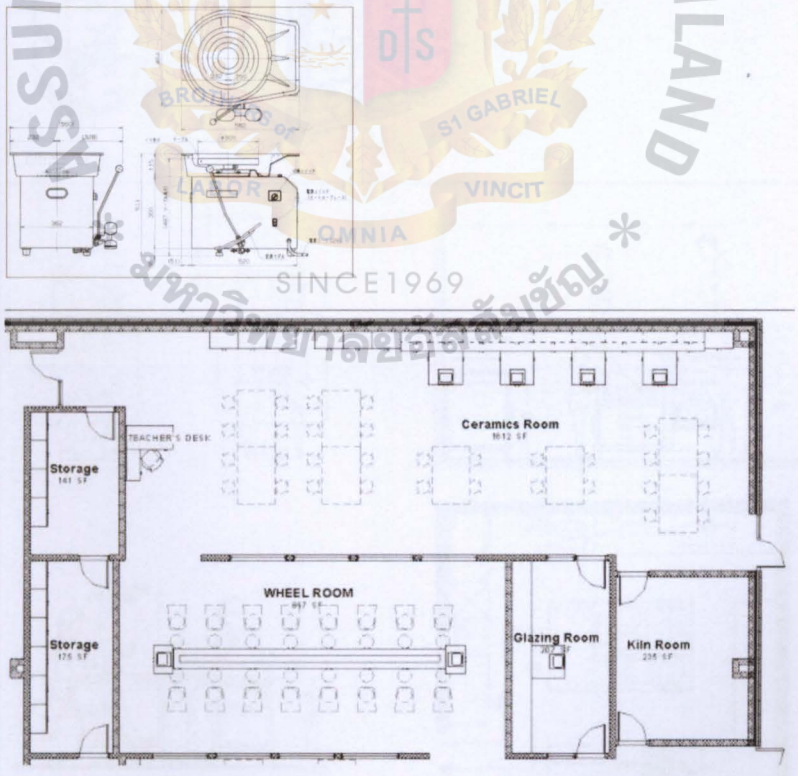
TABLE 3.4.4 FUNCTIONS AND FACILITY STUDY: FACILITY AREA

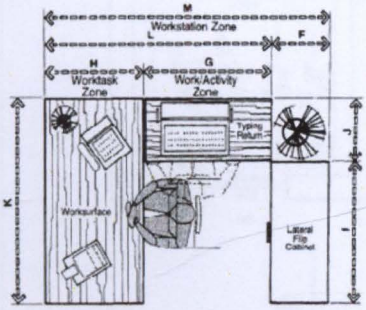
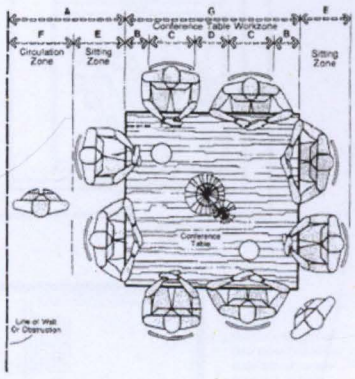
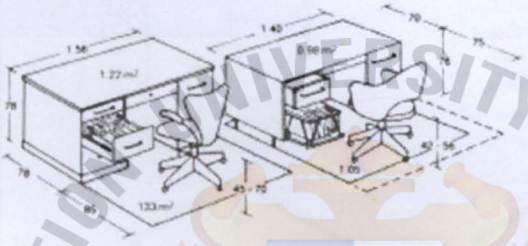
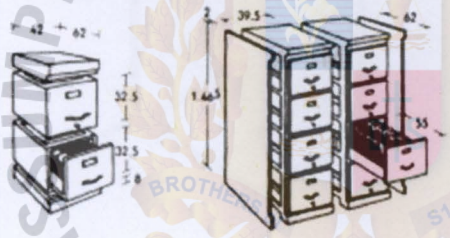
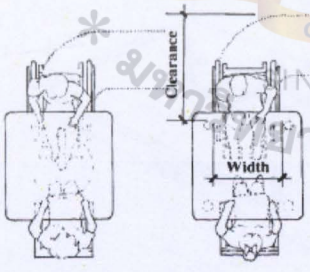
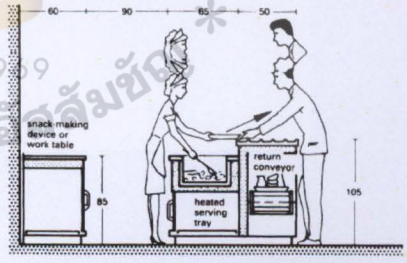
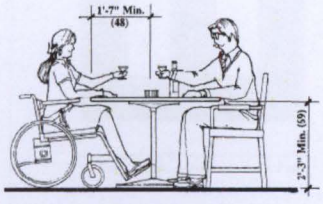
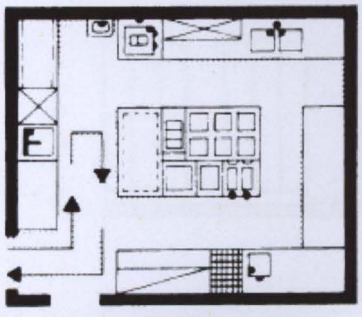
Area	Function	Type of User			
		Student	Visitor	Teacher	Staff
Facility area	Multi-purposes area	●	●	●	●
	Cafeteria	●	●	●	●
	W.C	●		●	●
	Shower	●		●	●
	Play area	●			
	Sport area	●		●	

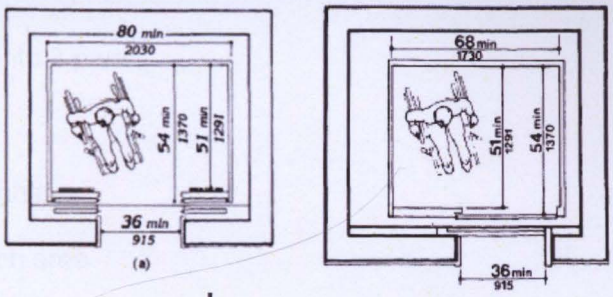
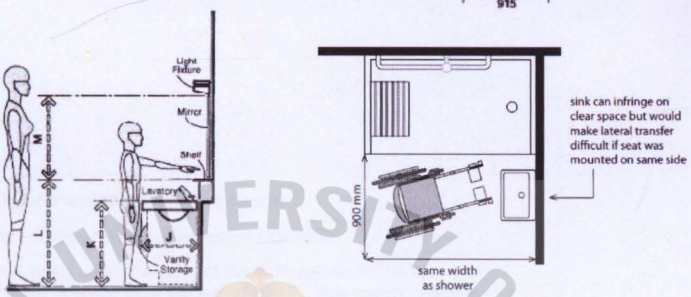
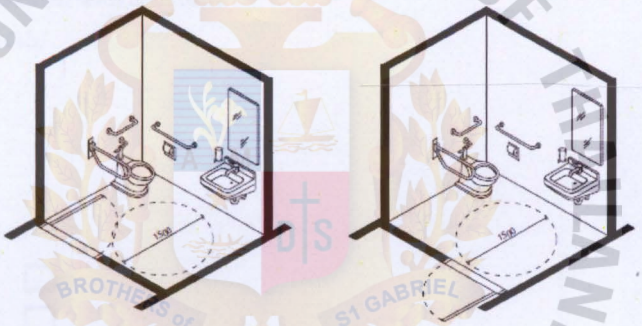
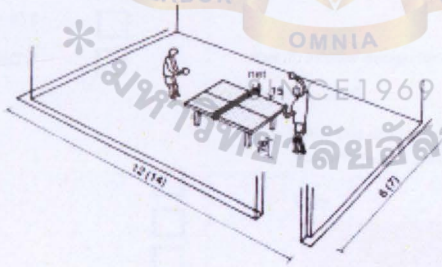
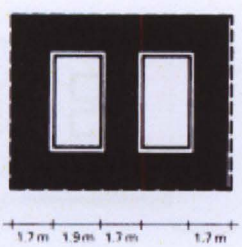
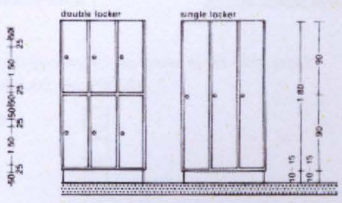
3.4.2 Function and Equipment Study

TABLE 3.4.5 FUNCTIONS AND EQUIPMENT

Area	Function and Equipment
Lobby area: -Reception -Waiting area -Consultation area	
Learning area: -Classroom -Computer room -Library	

Area	Function and Equipment
Learning area: Drawing and Painting	
Learning area: Ceramic Art -Ceramic room -Wheel room -Kiln room -Glazing room	

Area	Function and Equipment
Office area: **-Office** **-Meeting** **-Storage**	   
Facility area: **-Cafeteria** **-Kitchen** **-Elevators** **-W.C**	    **Kitchen for 60-100 seating** **50 sq.m**

Area	Function abs Equipment
	     

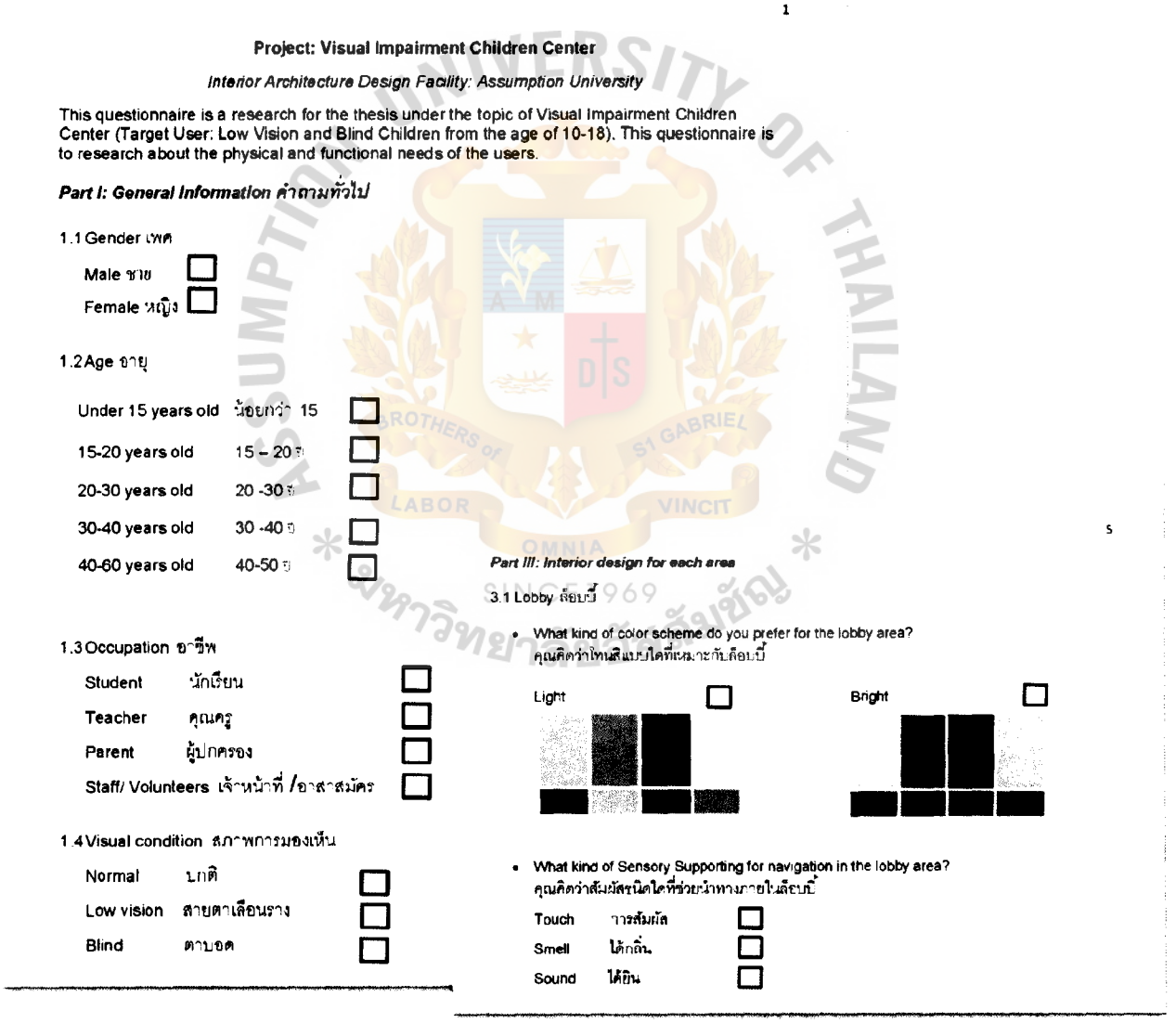
Shape and Form Study

3.5.1 Questionnaire

The Questionnaires divided into 3 parts;

- General Information
- Interior Space and Lighting
- Interior design for each area

(see Appendix A)



1

Project: Visual Impairment Children Center

Interior Architecture Design Facility: Assumption University

This questionnaire is a research for the thesis under the topic of Visual Impairment Children Center (Target User: Low Vision and Blind Children from the age of 10-18). This questionnaire is to research about the physical and functional needs of the users.

Part I: General Information คำถามทั่วไป

1.1 Gender เพศ

Male ชาย ☐
Female หญิง ☐

1.2 Age อายุ

Under 15 years old น้อยกว่า 15 ☐
15-20 years old 15 – 20 ☐
20-30 years old 20 -30 ☐
30-40 years old 30 -40 ☐
40-60 years old 40-50 ☐

1.3 Occupation อาชีพ

Student นักเรียน ☐
Teacher คุณครู ☐
Parent ผู้ปกครอง ☐
Staff/ Volunteers เจ้าหน้าที่ /อาสาสมัคร ☐

1.4 Visual condition สภาพการมองเห็น

Normal ปกติ ☐
Low vision สายตาเลือนราง ☐
Blind ตาบอด ☐

5

Part III: Interior design for each area

3.1 Lobby ล็อบบี้

- What kind of color scheme do you prefer for the lobby area?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับล็อบบี้

Light ☐

Bright ☐

- What kind of Sensory Supporting for navigation in the lobby area?
  คุณคิดว่าสัมผัสนิดใดที่ช่วยนำทางภายในล็อบบี้

Touch การสัมผัส ☐
Smell ได้กลิ่น ☐
Sound ได้ยิน ☐

FIGURE 3.5.1 QUESTIONNAIRE

Percentage of Questionnaires

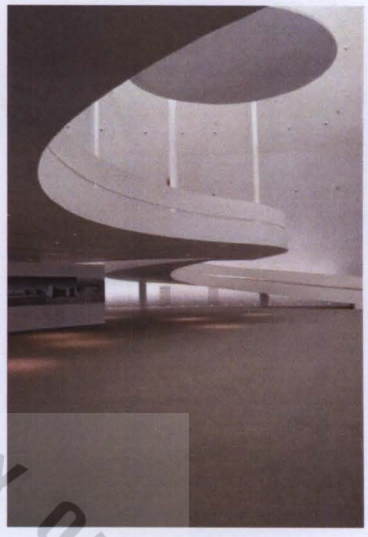
1.Percentage of Preferable Space Form

Simple Geometric Form

50 %

Diagonal Form

15%



Curve Form

35%

FIGURE 3.5.2 QUESTIONNAIREPERCENTAGE: SPACE FORM

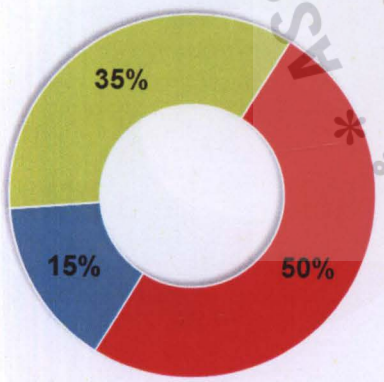


FIGURE 3.5.3 QUESTIONNAIREPERCENTAGE OF PREFERABLE SPACE FORM

2. Percentage of Sensory Supported for Orientation for Visual Impairment

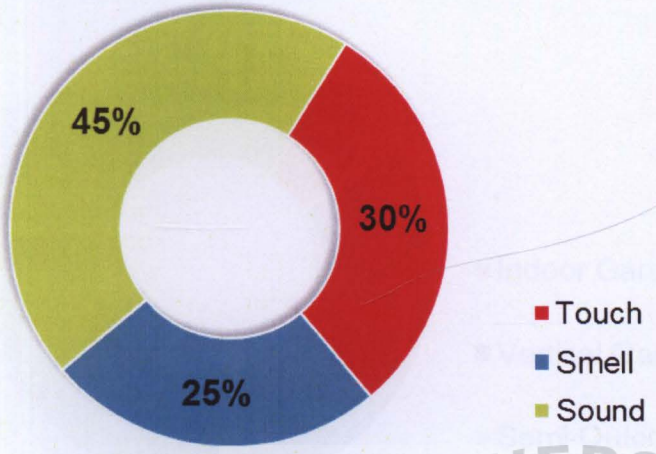


FIGURE 3.5.4 PERCENTAGE OF SENSORY SUPPORTED FOR ORIENTATION FOR VISUAL IMPAIRMENT

3. Percentage of Preferable Atmosphere for Visual Impairment

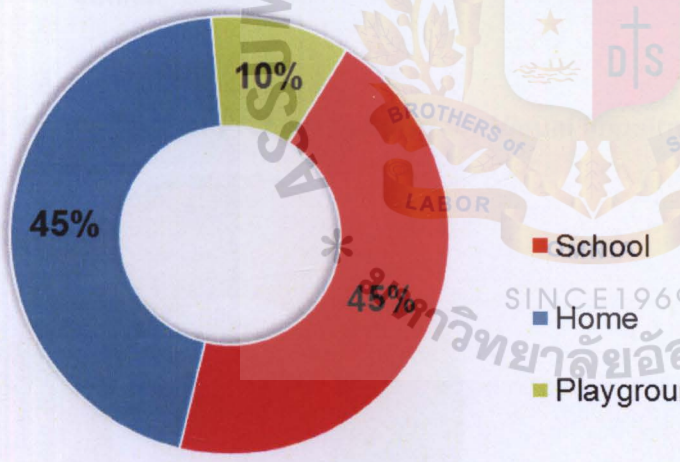


FIGURE 3.5.5 PERCENTAGE OF PREFERABLE ATMOSPHERE FOR VISUAL IMPAIRMENT

4. Percentage of Green Area

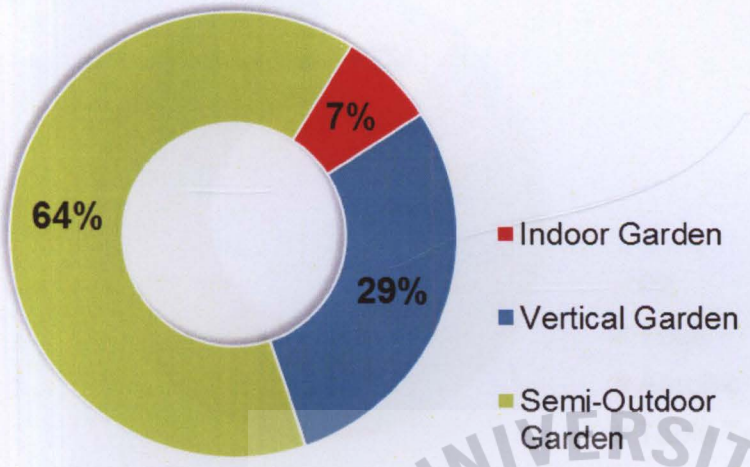


FIGURE 3.5.6 PERCENTAGE OF GREEN AREA

- From the result of the questionnaire, it is essential to have outdoor space and indoor connected together to create a better experiences and atmosphere in the educational center.

5. Percentage of Preferable Sport for Visual Impairment.

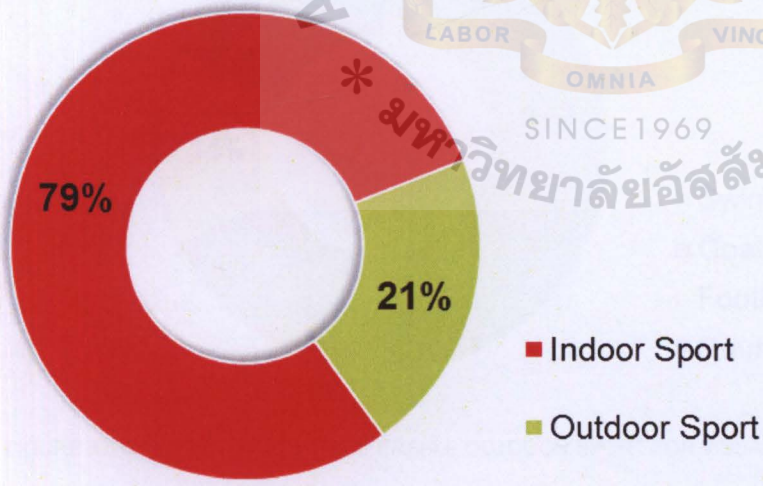


FIGURE 3.5.7 PERCENTAGE OF PREFERABLE SPORT FOR VISUAL IMPAIRMENT.

6. Percentage of Preferable Indoor Sport for Visual Impairment

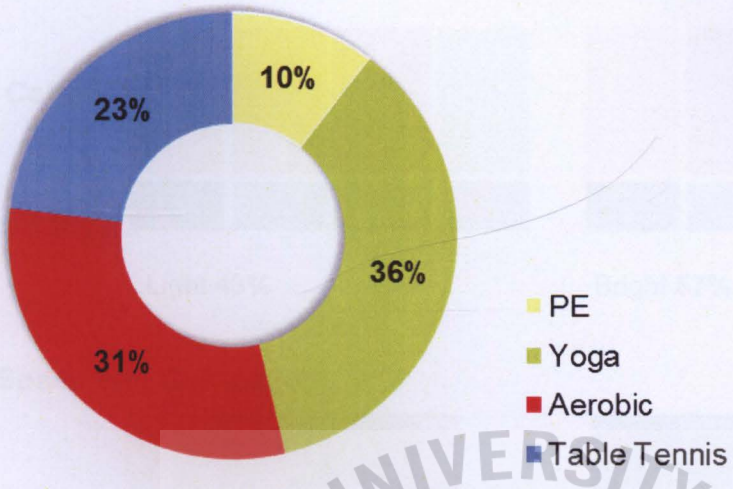


FIGURE 3.5.8 PERCENTAGE OF PREFERABLE INDOOR SPORT FOR VISUAL IMPAIRMENT

7. Percentage of Preferable Outdoor Sport for Visual Impairment

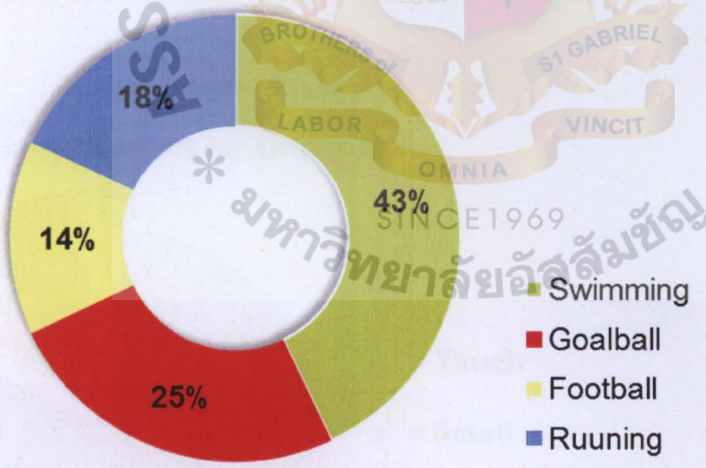
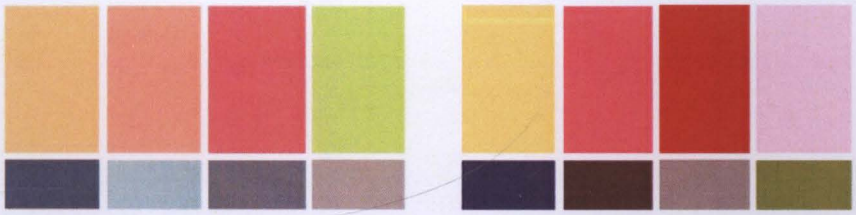


FIGURE 3.5.9 PERCENTAGE OF PREFERABLE OUTDOOR SPORT FOR VISUAL IMPAIRMENT

Percentage of Questionnaires

1. Lobby Area

- **Color**



Light 43% Bright 57%

- **Space and Circulation**

Linear 71% Curve 29%

FIGURE 3.5.10 QUESTIONNAIRE: LOBBY COLORS AND SPACE

- **Sensory Support for Orientation**

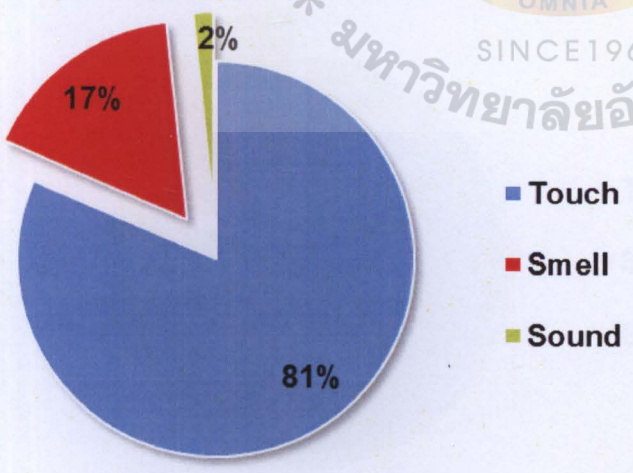


FIGURE 3.5.11 PERCENTAGE OF SENSORY SUPPORT FOR ORIENTATION IN LOBBY AREA

Percentage of Questionnaires

2. Multi-purpose & Library

- **Color**

Light 41% Bright 59%

- **Space and Circulation**

Linear 67% Curve 33%

FIGURE 3.5.12 QUESTIONNAIRE: MULTI-PURPOSES COLORS AND SPACE

- **Sensory Support for Orientation**

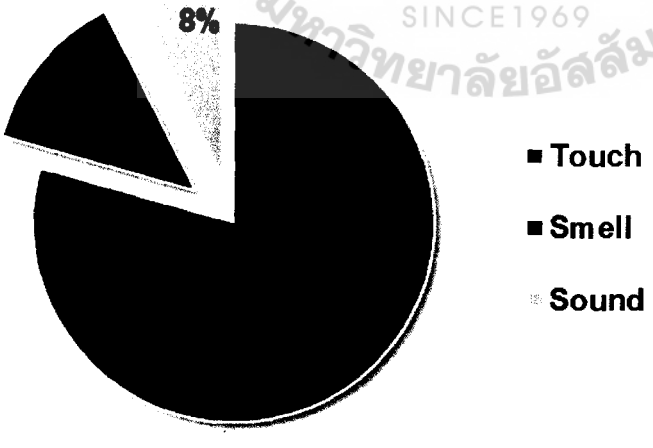


FIGURE 3.5.13 PERCENTAGE OF SENSORY SUPPORT FOR ORIENTATION IN MULTI-PURPOSE AREA

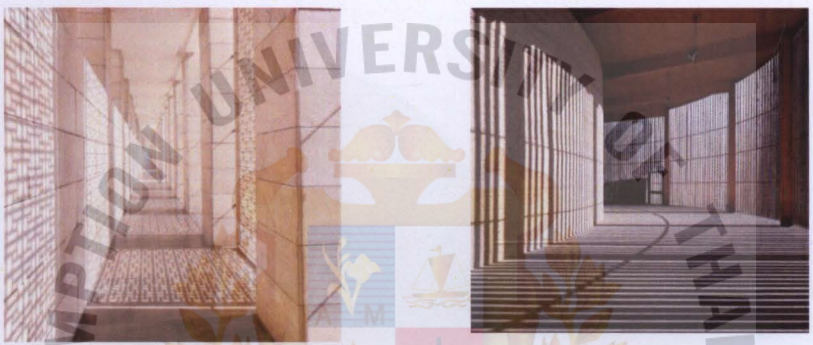
Percentage of Questionnaires

2. Multi-purpose & Library

- **Color**

Light 41% Bright 59%

- **Space and Circulation**



Linear 67% Curve 33%

FIGURE 3.5.12 QUESTIONNAIRE: MULTI-PURPOSES COLORS AND SPACE

- **Sensory Support for Orientation**

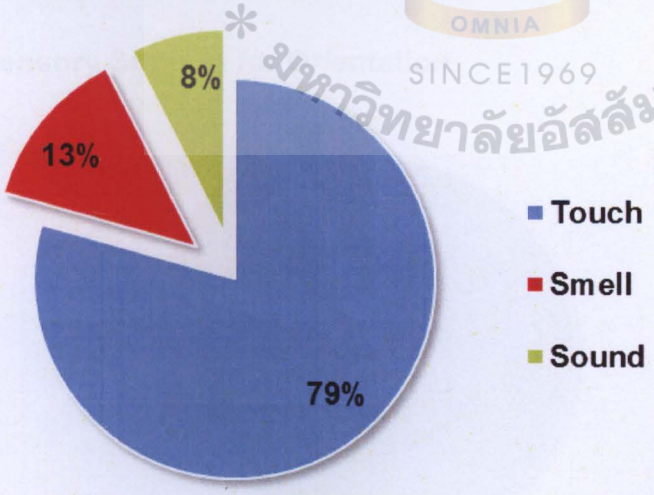


FIGURE 3.5.13 PERCENTAGE OF SENSORY SUPPORT FOR ORIENTATION IN MULTI-PURPOSE AREA

Percentage of Questionnaires

4. Cafeteria/ Dining

- **Color**

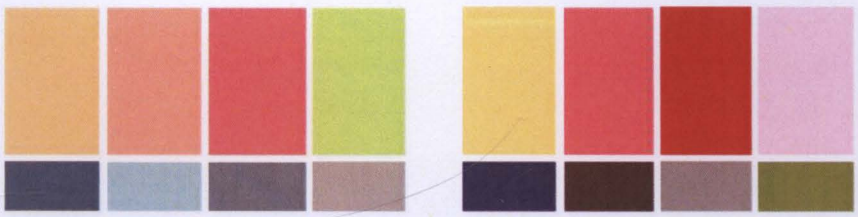


FIGURE 3.5.14 QUESTIONNAIRE: CAFETERIA/ DINNING COLORS AND SPACE

- **Service Type**

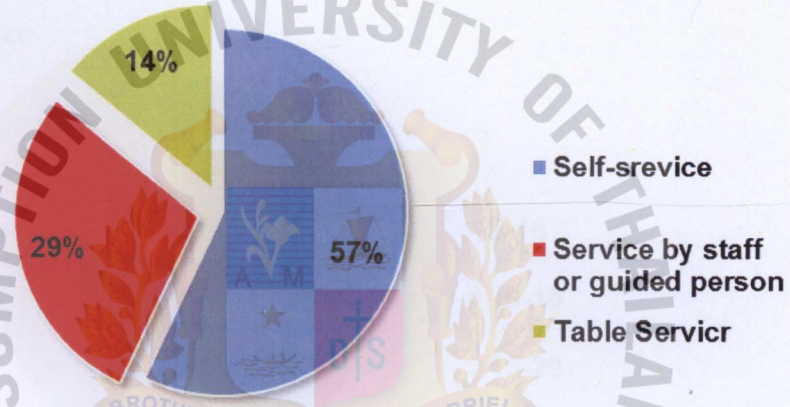


FIGURE 3.5.15 PERCENTAGE OF SERVICE TYPE FOR CAFETERIA

- **Sensory Support for Orientation**

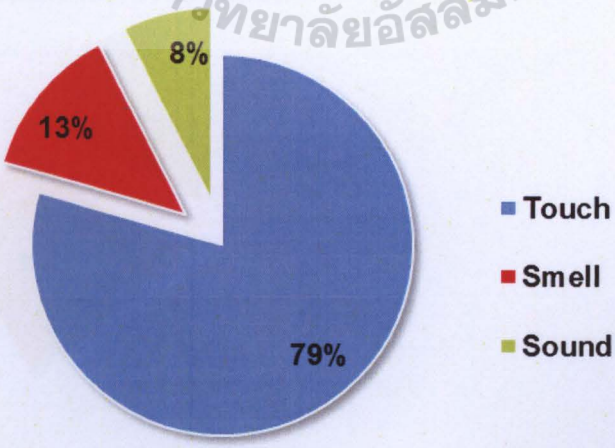
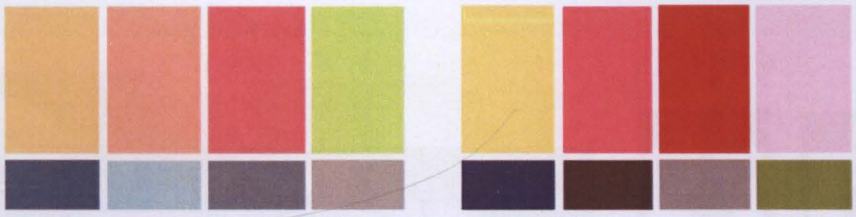


FIGURE 3.5.16 PERCENTAGE OF SENSORY SUPPORT FOR ORIENTATION IN CAFETERIA

Percentage of Questionnaires

4. Classroom & Workshop (Vocational)

- Color



Light 72% Bright 28%

FIGURE 3.5.17 QUESTIONNAIRE: CLASSROOM & WORKSHOP COLORS AND SPACE

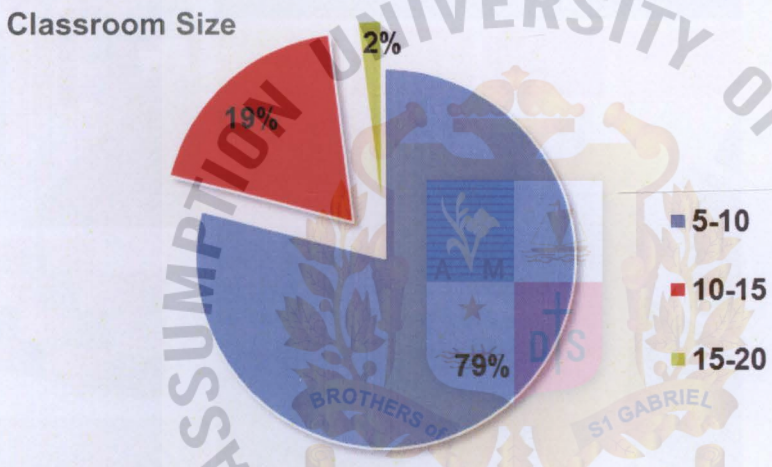


FIGURE 3.5.18 PERCENTAGE OF CLASSROOM SIZE

- Sensory Support for Orientation

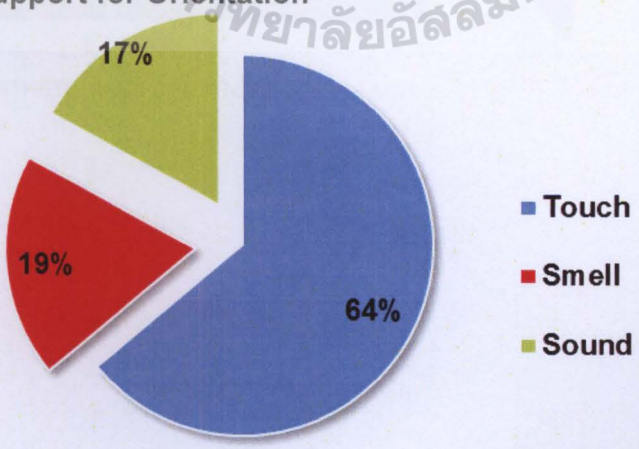


FIGURE 3.5.19 PERCENTAGE OF SENSORY SUPPORT FOR ORIENTATION IN CLASSROOM & WORKSHOP

Lobby Aesthetic and Form Studies

LOBBY

User

Form
Simple Geometric Form

Lighting
Natural Lighting

Sensory Support
Touch
Smell

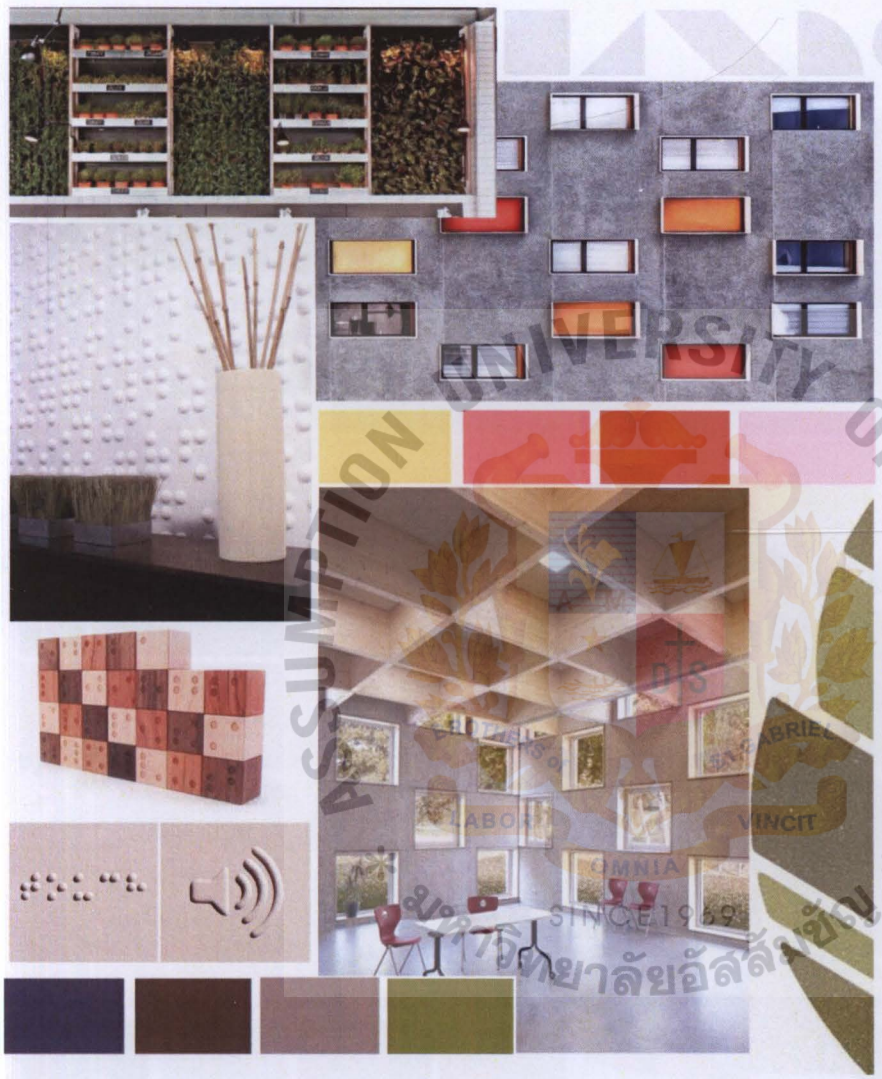
Atmosphere
School
Warm
Welcome

FIGURE 3.5.20 LOBBY AESTHETIC AND FORM STUDY

MULTI-PURPOSES & LIBRARY

FIGURE 3.5.21 MULTI-PURPOSE AREA AESTHETIC AND FORM STUDY

CAFETERIA/ DINING



User

Form
Simple Geometric Form

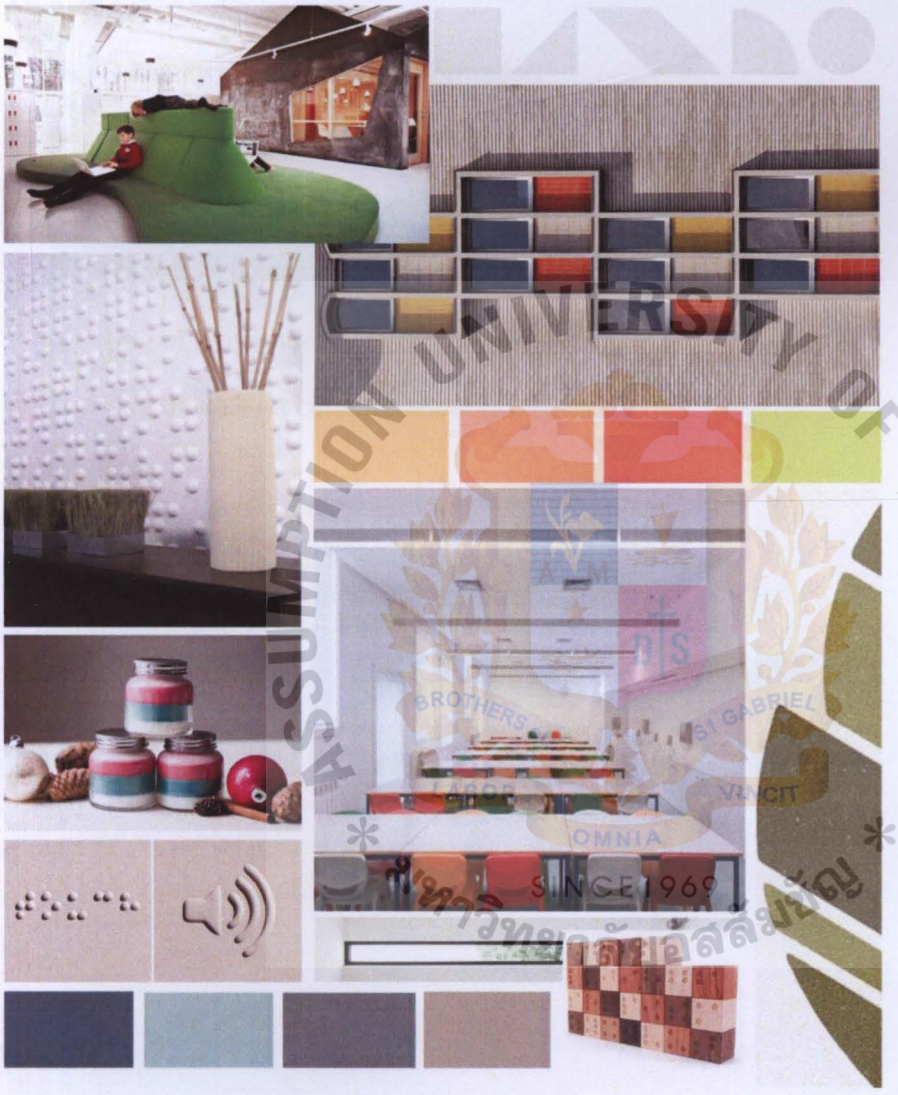
Lighting
Natural Lighting

Sensory Support
Touch
Sound

Atmosphere
School
Comfortable

FIGURE 3.5.22 CAFETERIA/ DINING AREA AESTHETIC AND FORM STUDY

CLASSROOM & WORKSHOP (VOCATIONAL)



User

Form
Simple Geometric Form

Lighting
Natural Lighting
Artificial Lighting

Sensory Support
Touch
Smell

Atmosphere
School
Comfortable

FIGURE 3.5.23 CLASSROOM & WORKSHOP AESTHETIC AND FORM STUDY

3.6 Project Specifics Sightless or Partially Sighted Persons

All people with vision impairment will rely on whatever vision they have as well as other aids to find their way around. Provision of physical and other sensory cues such as touch, sound, smell as well as tactile or audible information is therefore important aids for them to move independently[20].

- Difficulty in Interpreting Information
- Poor or Complete Degradation of Sight
- Prevalence of Poor Coordination and Orientation
- Require Physical Assistance/ Supervision
- Use of Movement Aids
- Use of walking cane to detect obstructions

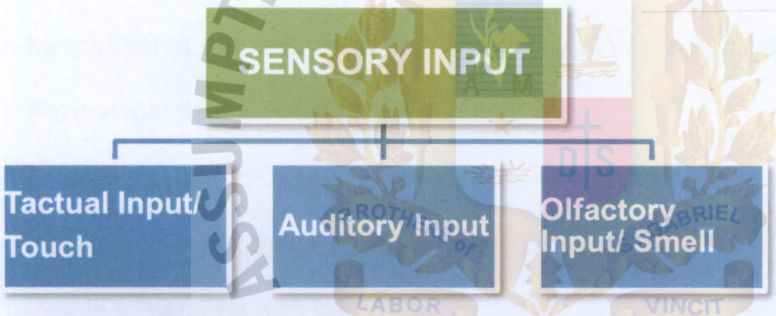


FIGURE 3.6.1 SENEORY INPUT FOR VISUAL IMPAIRMENT

[20] Building and Construction Authority, *Universal Design Guideline (Commercial Building)* (Singpore: The Department of Architecture School of Design & Environment, National University, 2006), 12-13, https://www.bca.gov.sg/BarrierFree/others/ud_guides.pdf.

Tactual Input/ Touch

1. Texture and Pattern

- For Way-finding strategies
- People with low vision : tactile and visual cues
- Persons who are blind and use a cane or a dog : texture at the walking surface, the acoustic quality of the space, and the availability of Braille or other tactile information
- However, contrast and color are essential for persons with visual limitations
- The color should be at least 70% (or greater) contrast.
- The use of bright yellow, which is acceptable at 40% contrast

2. Tactile warning strip

- Floor surface with cane-detectable and high contrast 600 mm - 915 mm deep, should be located at the end of landing in each flight of steps or stairs to warn persons who have visual limitations that a level change
- From the edge: 250 mm
- Bright yellow or other saturated colors from the warm end of the spectrum are most visible to persons with low vision
- Suitable warning textures for interior use include: raised domes, dots or squares and applied non-slip strips for persons with sight loss

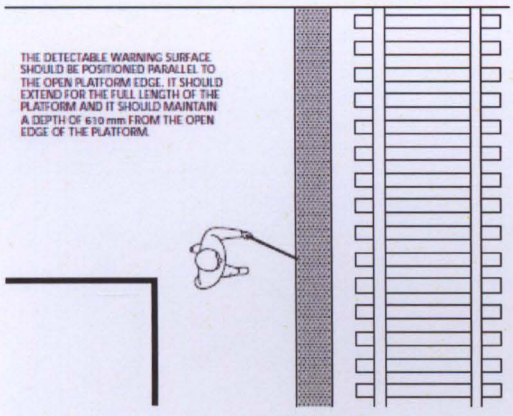


FIGURE 3.6.2 TACTILE WARNING STRIP

3. Texture and Pattern

Floor Surfaces/Textures

- Interior and exterior floor/paving surfaces should be of a non-slip and low-glare material.
- Supplementary textural cues can also be provided (e.g., by using different floor textures or materials in major and minor interior routes) as an aid to persons who are blind or who have visual limitations.
- Carpet in areas accommodating wheelchair traffic a level loop pile of non-static nylon (or better) is recommended with a pile height no greater than (6mm).
- Resilient floor with matt wall finishes are preferable.
- Reflected shiny surfaces as well as shiny desk tops should be avoided.
- Satin finish metals are also preferable to shiny chrome or brass which might produce glare.

5. Touch

"Seeing's believing, but feeling's the truth" Thomas Fulle

- Touch is also one of the significant senses that provide person with sight loss to gain communication and direction. Providing braille in handrail and wall and texture map to describe location of the space and building.

Standard dimension of Braille

TABLE 3.6.1 STANDARD DIMENSION OF BRAILLE

Measurement Range for	Minimum	Maximum
Dot Base Dimension	1.5 mm	1.5 mm
Distance between any two dots in same cells, centers to center	2.3 mm	2.5 mm
Distance between corresponding dots in adjacent cells, centers to center	6.1 mm	7.6 mm
Dot Heights	0.6 mm	0.8 mm
Distance between corresponding dots from one cells to the cells directly below, center to center	10.0 mm	10.1 mm

Sign, Raised Graphic & Characters Sloped Surface Information

- Control buttons or card access locations should be easy to identify and useable by persons with low vision or limited manual dexterity.
- Lettering for room numbers or names: no smaller than 25 mm high.
- For Braille users, braille information should be located immediately below all room numbers and names, as well as below any major directional signs.
- In larger public facilities, a tactile map of the facility showing the distribution and location of key areas/space should be provided in the main entrance lobby.

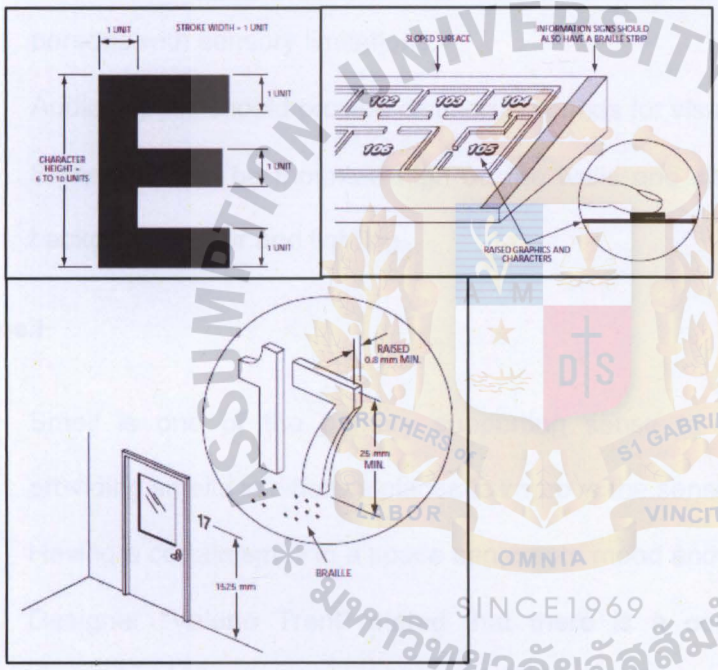


FIGURE 3.6.3 SIGN, RAISED GRAPHIC & CHARACTERS SLOPED SURFACE INFORMATION

6. Auditory Input

- Space should have acoustic: sound proof to provide orientation clues.
- Escalators, fountains, and elevators should have well-defined acoustic and also assisting with sound producing technique to navigate space.
- Noise should be eliminating in the space as it can confused the users.

7. Audio Systems and Signals

- Fire alarm signals should include both audible and visible components to alert persons with sensory limitations.
- Audio signals should provide distinctive sounds for visual impairment.
- Signals should be mounted high on the walls and should be easily visible against background color and lighting.

8. Smell

- Smell is one of the primary supporting sense to visual impairment, therefore, providing smells in different places to improve the sense as well as navigation.
- Having a certain smell in a space can create mood and environment.
- Designer "Valerie Trent" stated that there is a connection between smell and memory. "People can often recall aromas from childhood or a distinctive odor they've only smelled once. Whatever your particular nose prefers, smells do enhance comfort and happiness."[21]
- Smell may be natural or artificial; Scented candles, Fragrance or Essential oils, Potpourri, Fresh flowers.

[21] Institute for the Danube Region and Central Europe, "Senses in the Dark, Sense of Smell," Seeing in the Dark, accessed December 20, 2015, http://www.seeinginthedark.eu/senses-in-the-dark/sense-of-smell/.

8. Assistive technology for Vocational Learning

Artwork, Music and other creative activities are challenging and also provide creative opportunities for visual impairment students. People with low vision or visual affected are able to receive information through touch and sound; art is a way to help enhance how they can understand the world around them.

Learning Music[22]

The requirement for students with blindness;

- Descriptive translators to descript the data and information of the project
- Musical notation, scripts, and assignment instructions in Braille materials
- Clear verbal descriptions of visual aids, graphics, and instructions
- Raised-line drawings, tactile diagrams, or models

The requirement for students with low vision;

- All the documentation must be in in large print that is plan drawings, musical notation, scripts, and assignment instructions
- Seating arrangement according to the vision level and condition of the students
- Clear verbal descriptions of visual aids, graphics, and instructions
- Adequate lighting in work spaces
- Large monitors and/or screen enlargers

For the students who are legally blind, the computer system is with both braille keyboard and also voice recorder and voice which can help them to record their lessons to figure the progress of their music. For children who are blind or partially sighted low vision)

[22] Carmen Willings, "MUSIC ADAPTATIONS For Students who are Blind or Visually Impaired," Teaching Students with Visual Impairments, accessed November 17, 2015, http://www.teachingvisuallyimpaired.com/music.html.

learn the technical words such as loud and soft and the shape (structure) of pieces and memories them to help the students. Memorizing music is essential in learning music.

1. Braille Music Code

Braille music is a form of the six dot braille code used in literary braille. The code includes all the information presented on a standard sheet of a music score including notes and their values, dynamic, expression marks, and fingering. The student has to learn the scores for each hand which take longer time than normal students. Also they need to memorize the scores to perform the music.[23]

2. The Lime Lighter Music-Reading Solution for People with Low Vision[24]

Size: 45-57 x1 cm

Reading and writing magnified music, Touch screen

Custom Manhasset music stand and pedal

Read magnified music hands-free

Displays magnified print music notation from 1 to 10 times normal size.

Marking the Music: Using a standard

FIGURE 3.6.4 BRAILLE MUSIC CODE & ASSISTIVE TECHNOLOGY DEVICES

[23] "Teaching music to pupils with vision impairment," RNIB, accessed December 20, 2015, http://www.rnib.org.uk/information-everyday-living-home-and-leisure-music/music-education. (no author)

[24] Andrew Leibs, "Lime Lighter Music-Reading Solution for People with Low Vision," About.com, December 15,2015, http://assistivetechnology.about.com/od/AccessibleApps/fl/Make-Your-Website-More-Accessible-with-sitecues.htm.

Chapter 4: Data Collections

Chapter 4: Data Collections

4.1 Area requirement

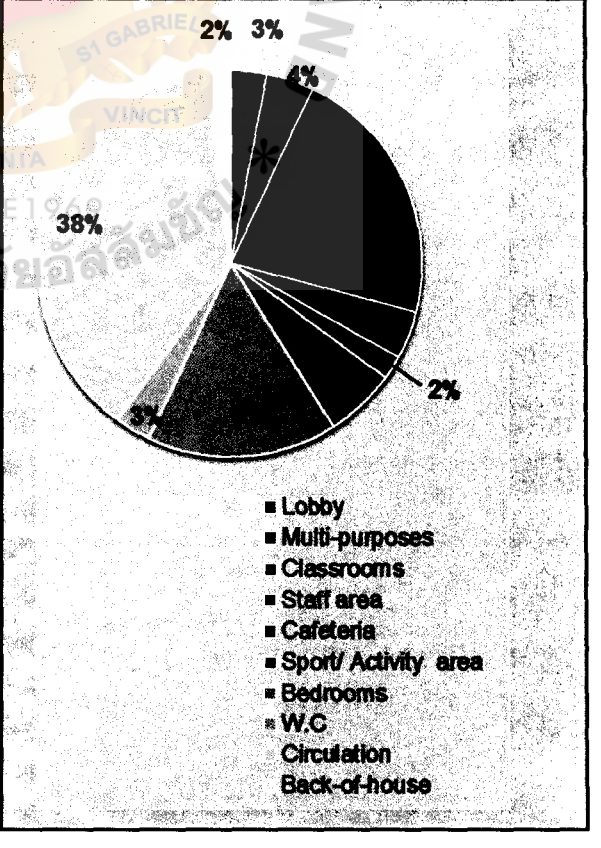
4.1.1 Area requirement from Case Studies

1. Pattaya Redemptorist School for the blind

- Location: Soi 16 Pattaya-Naklua Road, Chonburi 20150
- Site Area: 6700 sq.m
- Project Type: Primary, Secondary, High School & Vocational Training
- The Pattaya Redemptorist School for the blind serves for both blind and low vision students by providing education, rehabilitation and vocational training to visual impairment student

TABLE 4.1.1 CASE STUDY 1: FUNCTIONS AND AREA REQUIREMENTS

Function and Area requirement : Case Study I			
No.	**Function**	**Area (Sq.m)**	**Area %**
1.	Lobby	201	3
2.	Multi-purposes	272	4
3.	Classrooms	1474	22
4.	Staff area	268	4
5.	Cafeteria	130	2
6.	Sport/ Activity area	402	6
7.	Bedrooms	1072	16
8.	W.C.	201	3
9.	Circulation	2546	38
10.	Back-of-house	134	2
	Total	6700	100



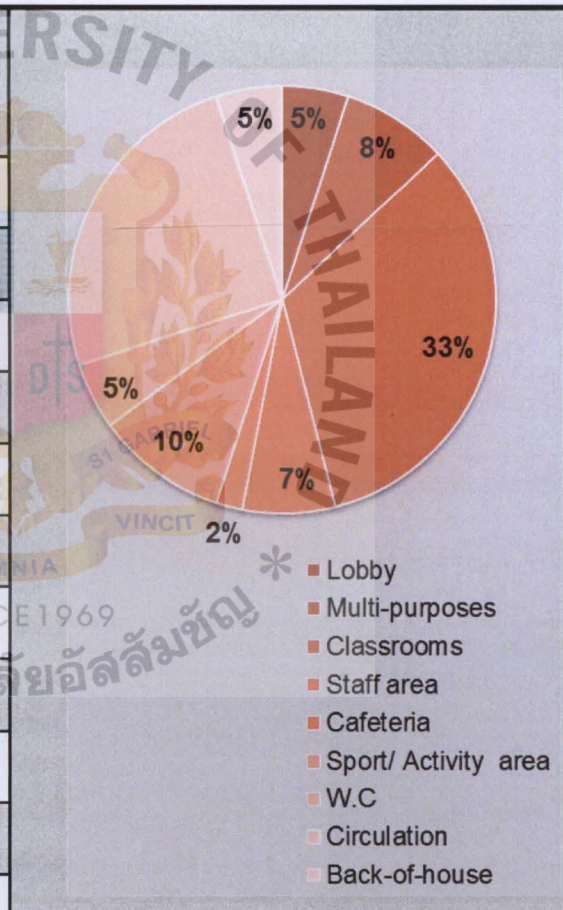
2. Center for the Blind and Visually Impaired, Mexico

- Architects: Taller de Arquitectura-Mauricio Rocha
- Location: Mexico City, D.F., Mexico
- Indoor Area: 8500 sq.m
- Project Year: 2001

TABLE 4.1.2 CASE STUDY 2: FUNCTIONS AND AREA REQUIREMENTS

Function and Area requirement : Case Study II

No.	Function	Area (Sq.m)	Area %
1.	Lobby	425	5
2.	Multi-purposes	680	8
3.	Classrooms	2805	33
4.	Staff area	595	7
5.	Cafeteria	170	2
6.	Sport/ Activity area	850	10
7.	Bedrooms	-	-
8.	W.C.	425	5
9.	Circulation	2125	25
10.	Back-of-house	425	5
	Total	8500	100



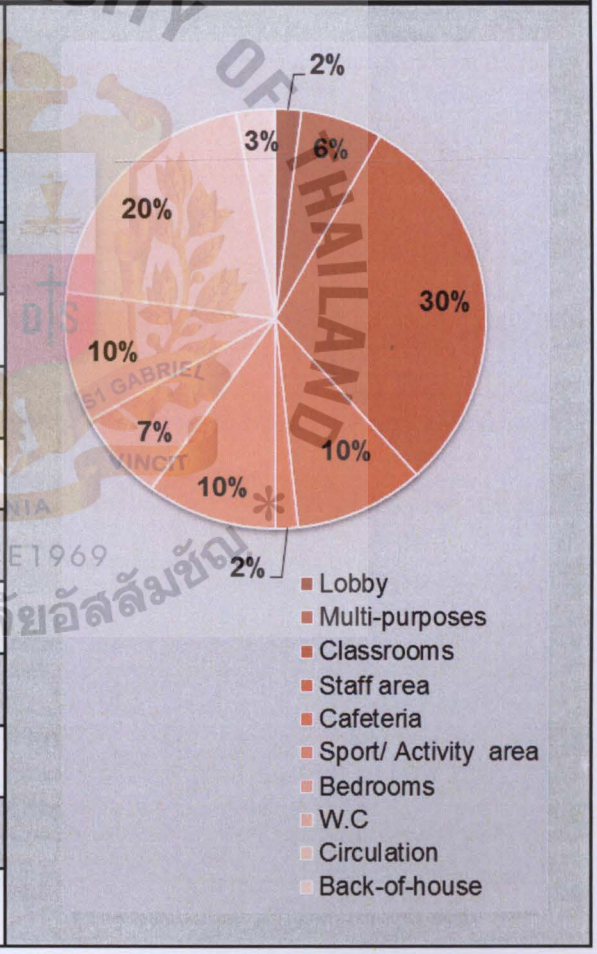
3. Hazelwood School for the Multiple Sensory Impaired

- Location: 50 Dumbreck Court, Glasgow, City of Glasgow, G415NG, United Kingdom
- Area of Site: 2600 sq.m
- Project Type: Educational, Elementary School for 2-18 years old
- Project Year: 2007

TABLE 4.1.3 CASE STUDY 3: FUNCTIONS AND AREA REQUIREMENTS

Function and Area requirement : Case Study III

No.	Function	Area (Sq.m)	Area %
1.	Lobby	52	2
2.	Multi-purposes	164	6.3
3.	Classrooms	780	30
4.	Staff area	260	10
5.	Cafeteria	44	1.7
6.	Sport/ Activity area	260	10
7.	Bedrooms	182	7
8.	W.C	260	10
9.	Circulation	520	20
10.	Back-of-house	78	3
	Total	2600	100



4. Grousbeck Center for Students and Technology at Perkins School for the Blind

- Location: Watertown, Massachusetts, USA
- Area of Site: 3000 sq.m
- Project Type: Social and Teaching Center
- Project Year: 2011

TABLE 4.1.4 CASE STUDY 4: FUNCTIONS AND AREA REQUIREMENTS

Function and Area requirement : Case Study IV

No.	Function	Area (Sq.m)	Area %
1.	Lobby	150	5
2.	Multi-purposes	570	19
3.	Classrooms	840	28
4.	Staff area	600	20
5.	Cafeteria	90	3
6.	Sport/ Activity area	-	-
7.	Bedrooms	-	-
8.	W.C	120	4
9.	Circulation	600	20
10.	Back-of-house	30	1
	Total	3000	100

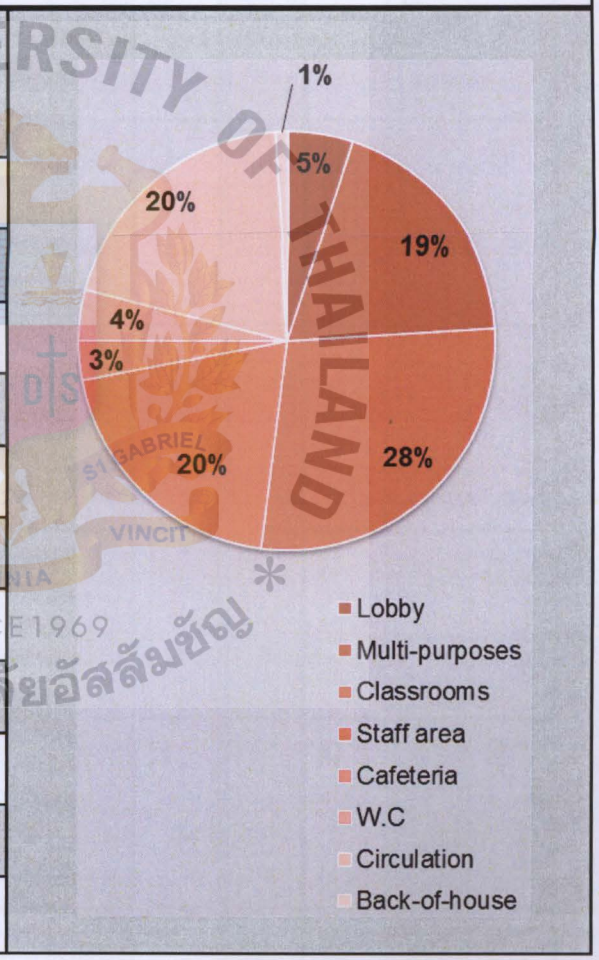


TABLE 4.1.5 AVERAGE OF AREA REQUIREMENTS (%) AND PROJECT AREA REQUIREMENTS

Function	Case Study 1 Pattaya Redemptorist School for the blind (%)	Case Study 2 Center for the Blind and Visually Impaired (%)	Case Study 3 Hazelwood School (%)	Case Study 4 Grousbeck Center for Student and Technology (%)	Project's Average Area Allowance (%)	Project's Average Area Allowance (sq.m)	Project's Area Requirement (%)	Project's Area Requirement (sq.m.)
Lobby	**3**	**5**	**2**	**5**	**3.75**	**281.25**	**4.05**	**326.64**
Multi-purposes	4	8	6.3	19	9.4	705	**4.28**	**345**
Classrooms	**25**	**36**	**30**	**31**	**30.5**	**2287.5**	**37.12**	**2991.4**
Staff area	4	7	10	20	10.3	772.5	**7.61**	**613.49**
Cafeteria	**2**	**2**	**1.7**	**3**	**2.2**	**165**	**2.94**	**236.85**
Sport/ Activity area	6	10	10	-	8.7	652.5	**7.86**	**633.68**
W.C	**3**	**5**	**10**	**4**	**5.5**	**412.5**	**5.87**	**472.92**
Circulation	38	25	20	20	25.8	1935	**25**	**1511.25**
Back-of-house	**3.5**	**7**	**3**	**2**	**3.85**	**288.75**	**5.27**	**425.02**
Total	100 (6700 sq.m.)	100 (8500 sq.m.)	100 (2600 sq.m.)	100 (3000 sq.m.)	100	7500	**100**	**7556.25**

TABLE 4.1.5 AVERAGE OF AREA REQUIREMENTS (%) AND PROJECT AREA REQUIREMENTS

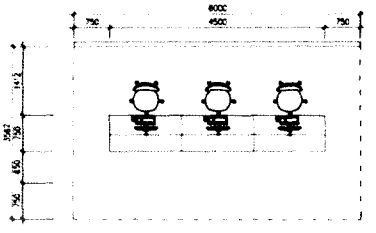
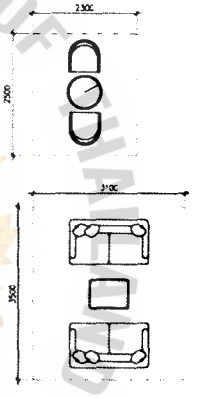
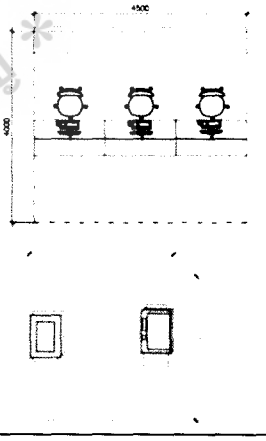
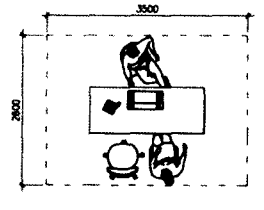
Function	Case Study 1 Pattaya Redemptorist School for the blind (%)	Case Study 2 Center for the Blind and Visually Impaired (%)	Case Study 3 Hazelwood School (%)	Case Study 4 Grousbeck Center for Student and Technology (%)	Project's Average Area Allowance (%)	Project's Average Area Allowance (sq.m)	Project's Area Requirement (%)	Project's Area Requirement (sq.m.)
Lobby	3	5	2	5	3.75	281.25	4.05	326.64
Multi-purposes	4	8	6.3	19	9.4	705	4.28	345
Classrooms	25	36	30	31	30.5	2287.5	37.12	2991.4
Staff area	4	7	10	20	10.3	772.5	7.61	613.49
Cafeteria	2	2	1.7	3	2.2	165	2.94	236.85
Sport/ Activity area	6	10	10	-	8.7	652.5	7.86	633.68
W.C	3	5	10	4	5.5	412.5	5.87	472.92
Circulation	38	25	20	20	25.8	1935	25	1511.25
Back-of-house	3.5	7	3	2	3.85	288.75	5.27	425.02
Total	100 (6700 sq.m.)	100 (8500 sq.m.)	100 (2600 sq.m.)	100 (3000 sq.m.)	100	7500	100	7556.25

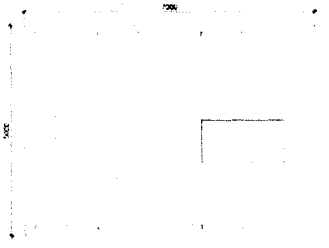
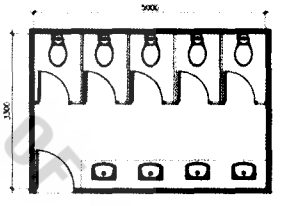
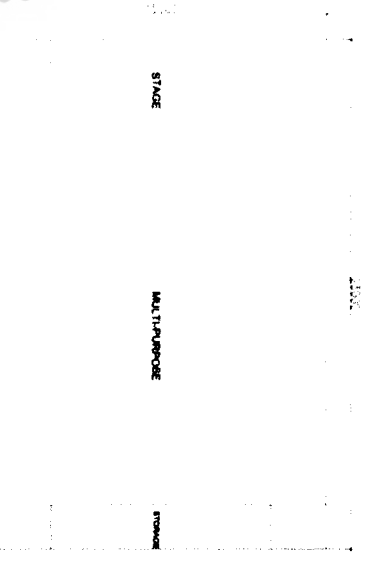
TABLE 4.1.5 AVERAGE OF AREA REQUIREMENTS (%) AND PROJECT AREA REQUIREMENTS

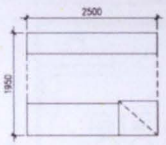
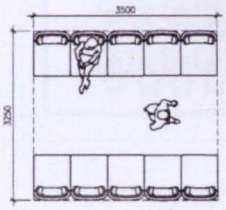
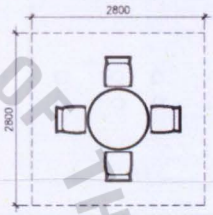
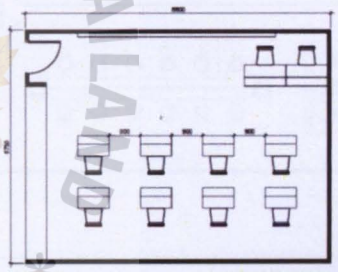
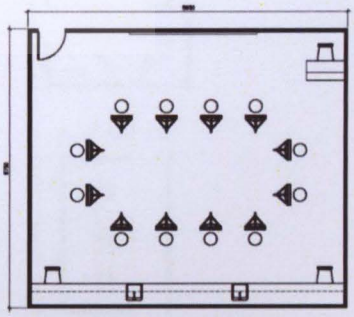
Function	Case Study 1 Pattaya Redemptorist School for the blind (%)	Case Study 2 Center for the Blind and Visually Impaired (%)	Case Study 3 Hazelwood School (%)	Case Study 4 Grousbeck Center for Student and Technology (%)	Project's Average Area Allowance (%)	Project's Average Area Allowance (sq.m)	Project's Area Requirement (%)	Project's Area Requirement (sq.m.)
Lobby	3	5	2	5	3.75	281.25	4.05	326.64
Multi-purposes	4	8	6.3	19	9.4	705	4.28	345
Classrooms	25	36	30	31	30.5	2287.5	37.12	2991.4
Staff area	4	7	10	20	10.3	772.5	7.61	613.49
Cafeteria	2	2	1.7	3	2.2	165	2.94	236.85
Sport/ Activity area	6	10	10	-	8.7	652.5	7.86	633.68
W.C	3	5	* 10	4	5.5	* 412.5	5.87	472.92
Circulation	38	25	20	20	25.8	1935	25	1511.25
Back-of-house	3.5	7	3	2	3.85	288.75	5.27	425.02
Total	100 (6700 sq.m.)	100 (8500 sq.m.)	100 (2600 sq.m.)	100 (3000 sq.m.)	100	7500	100	7556.25

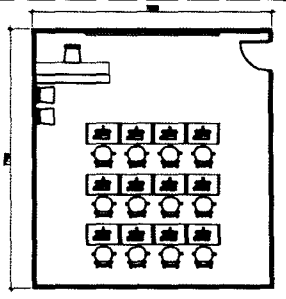
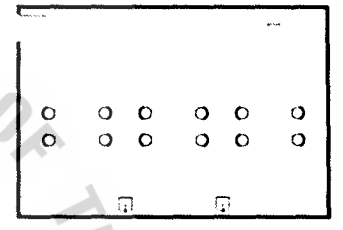
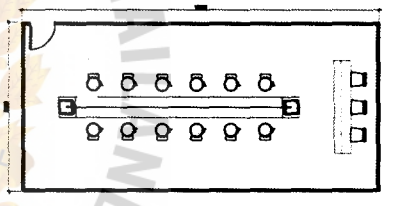
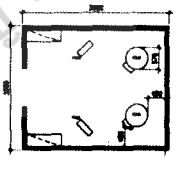
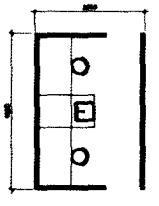
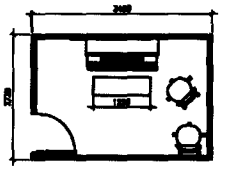
4.2 Estimated project area requirements

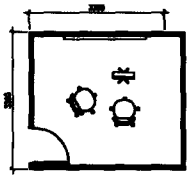
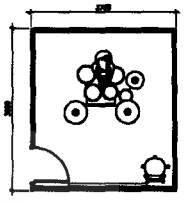
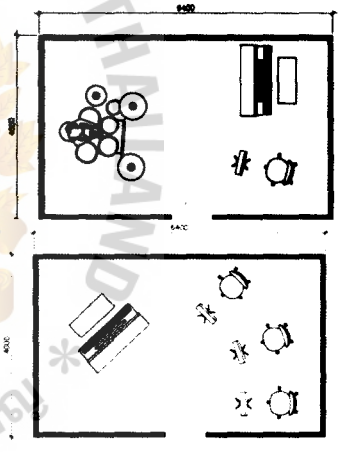
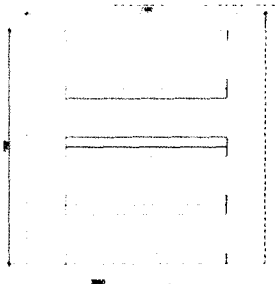
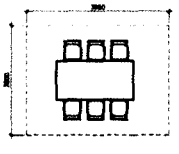
TABLE 4.1.6 ESTIMATED PROJECT AREA REQUIREMENTS

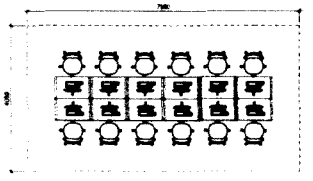
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Lobby					
Reception	Reception Counter Chair Computer	3	1	21.6 sq.m. x1 26.1 sq.m	
Waiting area	Table Armchairs	10	5	5.75 sq.m x 5 28.75 sq.m.	
	Table Sofa or Couch	20	4	10.85 sq.m x 4 43.4 sq.m	
Registration office	Counter Chairs Computer Cabinet	6	2	18 sq.m x 2 36 sq.m	
	Copy Machines Shelves		1	5.16 sq.m x1 5.16 sq.m	
Consultation	Table Chairs	15	5	9.1 sq.m x 5 45.5 sq.m	

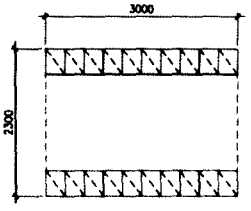
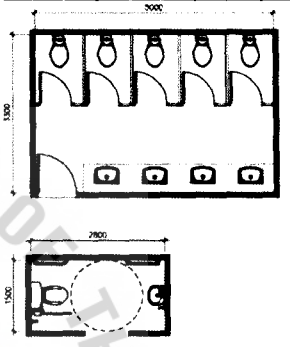
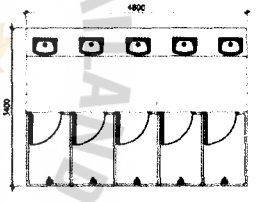
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Lobby					
Mini: Exhibition Area	Wallboard Display Table	20	1	35 sq.m x 1 35 sq.m	
W.C	Washing Sink Water Closet	10 2	2 2	16.5 sq.m x 2 33 sq.m 4.2 sq.m x 2 8.4 sq.m	 
				Total	**261.31 sq.m**
				Circulation 25%	**65.33 sq.m**
				Total area	**326.64 sq.m**
Multi-purposes Hall					
Multi-purposes Hall	Stage Storage	250	1	345 sq.m x 1 345 sq.m	

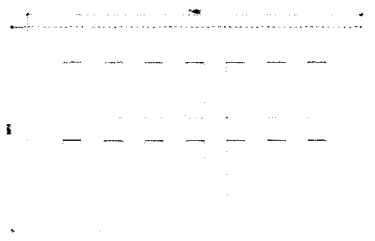
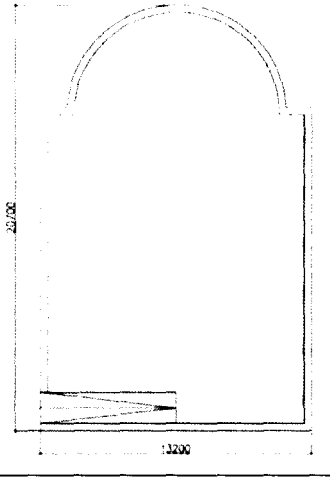
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Learning Area					
Student Lounge -Snack Bar -Seating	Shelves Stands Beverage Machines	6	3	4.875 sq.m x 3 14.63 sq.m	
	Long Seating	50	5	11.38 sq.m x 5 56.9 sq.m	
	Tables Chairs	40	10	7.84 sq.m x 10 78.4 sq.m	
General Classroom (One teacher: 4 students)	Tables Chairs Storage Shelves	144	18	59.4 sq.m x 18 1069.2 sq.m	
Workshop					
-Art room	Drawing Tables Chairs Sinks Storage	36	3	75.69 sq.m x 3 227.07 sq.m	

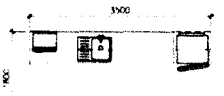
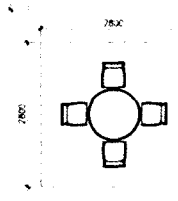
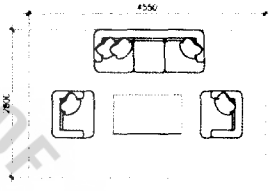
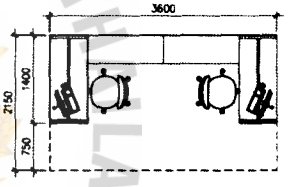
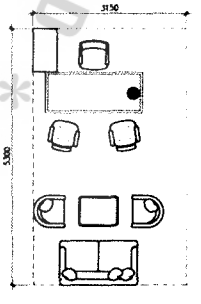
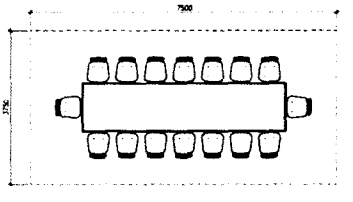
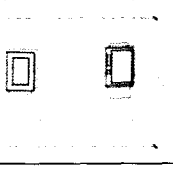
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Learning Area					
-IT/Computer Lab	Computer Station Chair	48	4	55.44 sq.m x 4 221.76 sq.m	
-Ceramic Art Room -Ceramic Room	Tables Chairs Blackboard Sinks Storage	36	3	77.58 sq.m x 3 232.74 sq.m	
-Wheel Room	Wheel tables Chairs Sinks	24	2	73.75 sq.m x 2 147.5 sq.m	
-Glazing Room		4	2	12.16 sq.m x1 12.16 sq.m	
-Klin Room				11.5 sq.m x 2 23 sq.m	
-Music room -Individual Practice Room:Piano	Upright Piano Chairs	10	10	9.42 sq.m x 10 94.2 sq.m	

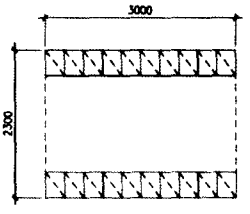
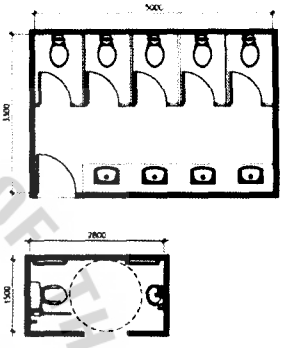
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Learning Area					
Individual Practice Room:Guitar	Guitar Chair Sheet Music Stand	10	10	12.54sq.m x10 125.4 sq.m	
-Individual Practice Room: Percussion	Drum Percussions Instruments Chairs	10	10	13.32sq.m x10 133.2 sq.m	
-Music room Group Practice Room	Musical Instrument Chairs	10	4	21.6 sq.m x 4 86.4 sq.m	
Library	Shelves	70	2	80 sq.m x2 160 sq.m	
	Research area Computer Station Chairs	12	1	30 sq.m x 1 30 sq.m	

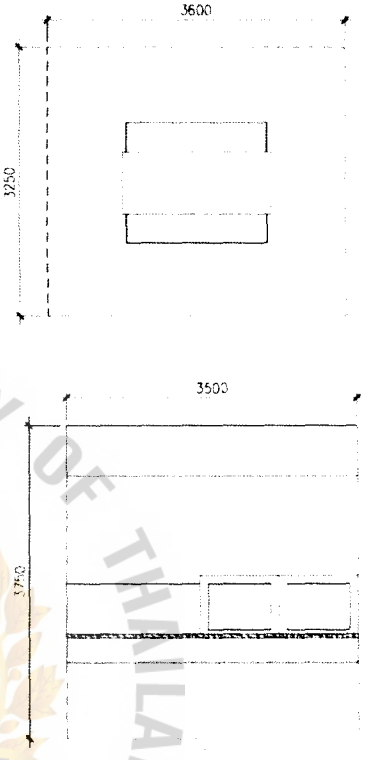
	Reading area Tables Chairs	60	10	10.22sq.m x10 102.2 sq.m	

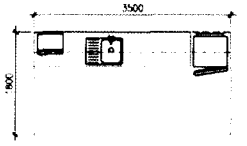
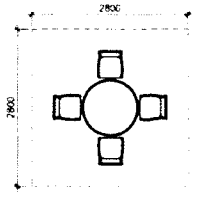
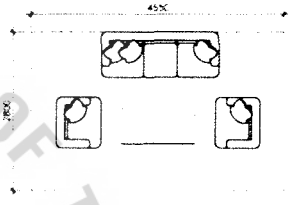
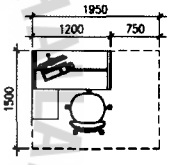
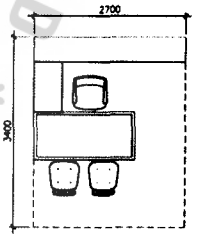
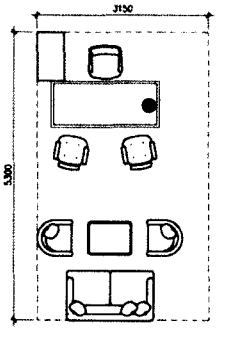
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Learning Area					
Locker	Cabinet/ Locker	160	4	6.9 sq.m x 4 27.6 sq.m	
W.C	Washing Sink Water Closet	40 4	8 4	16.5 sq.m x 8 132sq.m 4.2 sq.m x 4 16.8 sq.m	
Shower	Sinks Shower heads	10	2	16.32 sq.m x 2 32.64 sq.m	
				Total **Circulation 25%**	**2991.4 sq.m** **747.85 sq.m**
				Total area	**3739.25 sq.m**

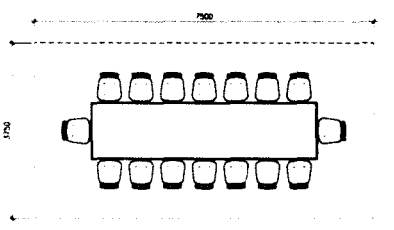
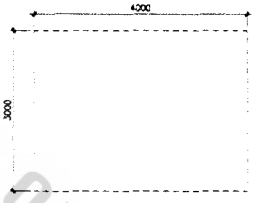
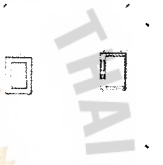
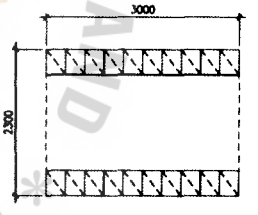
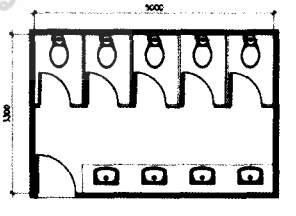
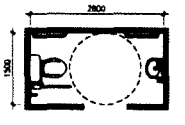
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Sport Area					
Indoor Sport -Yoga Room - Aerobic Room	Yoga map Storage Table tennis	28	2	79 sq.m x 2 158 sq.m	
-Table Tennis Court	Table tennis	8	2	38.25 sq.m x 2 76.5 sq.m	
-Goal ball Court			1	180 sq.m	
				Total **Circulation 25%**	**528.08 sq.m** **105 .6 sq.m**
				Total area	**633.68 sq.m**
-Indoor/ Outdoor Sport -Swimming Pool				260 sq.m	

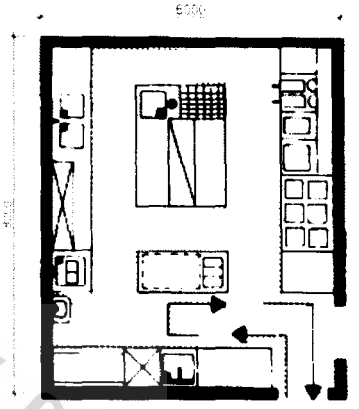
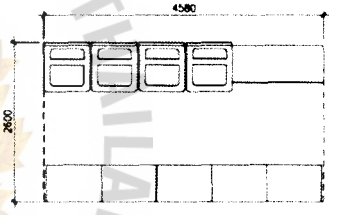
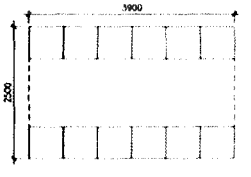
Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Teacher Office Area					
Teacher Lounge	Pantry	4	1	6.3 sq.m x 1 6.3 sq.m	
	Tables Chairs	20	5	7.84 sq.m x 5 39.2 sq.m	
	Sofa Tables	10	2	12.47x 2 25.48 sq.m	
Teacher office	Working Desk Chairs Side Tables	50	25	7.56 sq.m x 25 189 sq.m	
Principle Office	Working Table Chairs Sofa	1	1	16.7 sq.m x1 16.7 sq.m	
Meeting Room	Table Chairs	16	1	27.75 sq.m x 1 27.75 sq.m	
	Copy Machines Shelves		1	5.16 sq.m x1 5.16 sq.m	

Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Teacher Office Area					
Locker	Cabinet/ Locker	60	1	6.9 sq.m x 1 6.9 sq.m	
W.C	Washing Sink Water Closet	10 2	2 2	16.5 sq.m x 2 33 sq.m 4.2 sq.m x 2 8.4 sq.m	
				Total	**357.89 sq.m**
				Circulation 25%	**71.58 sq.m**
				Total area	**429.47 sq.m**

Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Cafeteria					
Cafeteria	Tables Bench	150	18	11.7 sq.m x 1 210.60 sq.m	
	Food Counter	6	2	13.13 sq.m x2 26.25 sq.m	
				Total	**236.85 sq.m**
				Circulation 25%	**47.37sq.m**
				Total area	**284.22 sq.m**

Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Office Area					
Staff Lounge	Pantry	4	1	6.3 sq.m x 1 6.3 sq.m	
	Tables Chairs	20	5	7.84 sq.m x 5 39.2 sq.m	
	Sofas Tables	10	2	12.74 sq.m x 2 25.48 sq.m	
Staff Office	Working Desk Chairs	30	30	2.925sq.m x30 97.75 sq.m	
Manager Office	Working Table Chairs Storage	6	6	9.18 sq.m x 6 55.08 sq.m	
Executive Office	Working Table Chairs Sofa	2	2	16.7 sq.m x2 33.4 sq.m	

Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Office Area					
Meeting Room	Table Chairs	16	1	27.75 sq.m x 1 27.75 sq.m	
Storage	Shelves Cabinet	1	1	12 sq.m x 1 12 sq.m	
	Copy Machines Shelves		1	5.16 sq.m x1 5.16 sq.m	
Locker	Cabinet/ Locker	60	2	6.9 sq.m x 2 13.8 sq.m	
W.C	Washing Sink Water Closet	20 2	4 2	16.5 sq.m x 4 66 sq.m 4.2 sq.m x 2 8.4 sq.m	 

Area	Furniture & Equipment	No. Of User	No. Of Unit	Area Requirement (Sq.M.)	Typical Area Furniture Layout
Back of House					
Kitchen	Stoves Oven Firers Refrigerator Freezer Preparing Table Sinks Washing Area Chimney	10	1	48 sq.m x1 48 sq.m	
Laundry	Washing machine Dryer Iron board Storage	3	1	11.9 sq.m x1 11.9 sq.m	
House-keeping	Shelves Cabinet		2	9.75 sq.m x 2 19.5 sq.m	
Storage	Shelves Cabinet		2	12 sq.m x2 24 sq.m	
Garbage	Trash bin		1	5.7 sq.m x 1 5.7 sq.m	
				Total **Circulation 20%**	**499.42 sq.m** **99.89 sq.m**
				Total area	**599.31 sq.m**

4.3 Adjacency Studies

4.3.1 Adjacency Matrix and Bubble Diagram

1. Overall Area Relationship Diagram

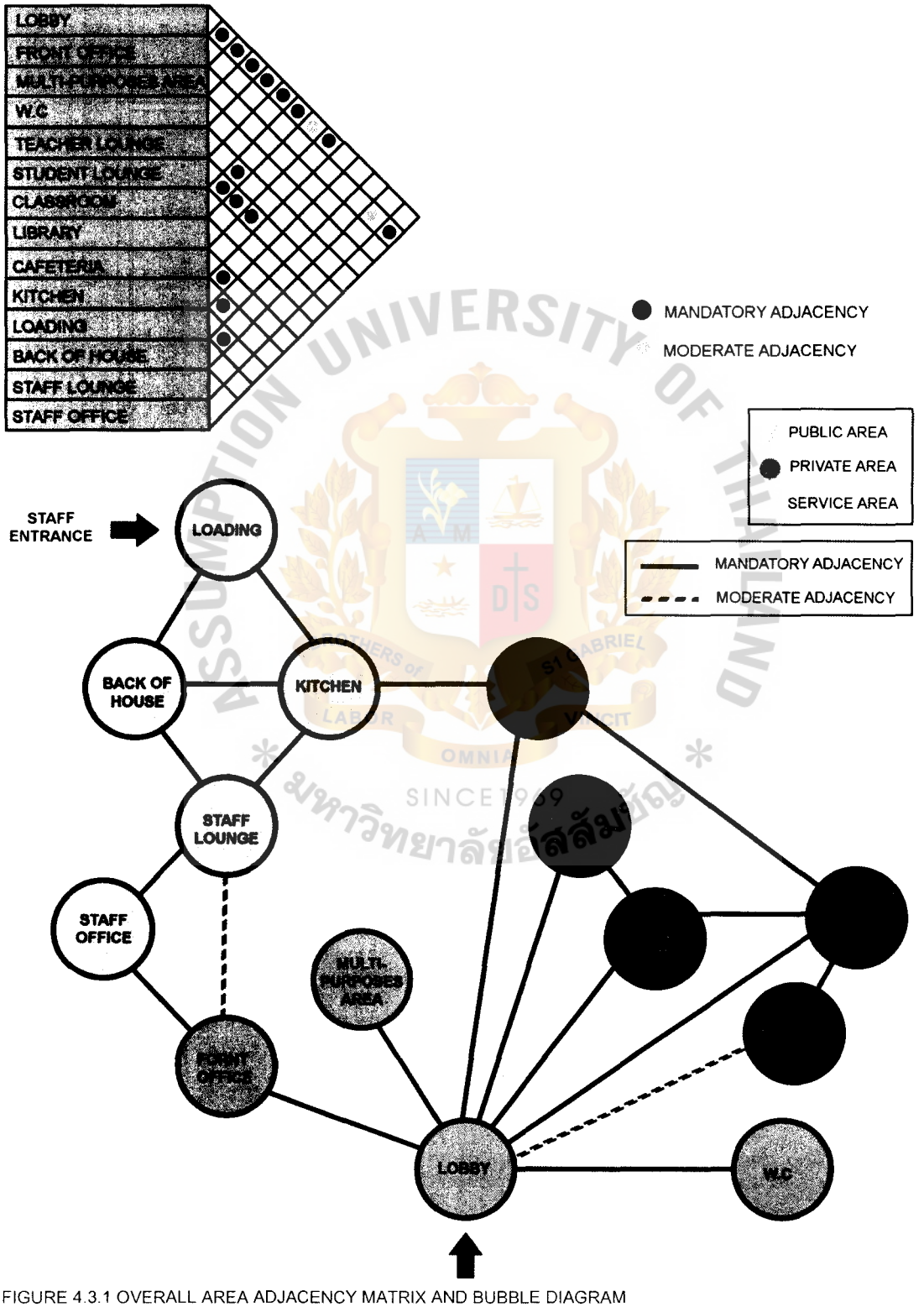
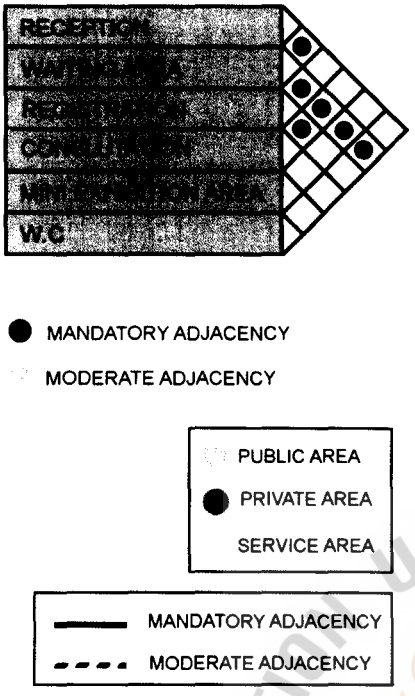


FIGURE 4.3.1 OVERALL AREA ADJACENCY MATRIX AND BUBBLE DIAGRAM

2. Lobby Area Relationship Diagram



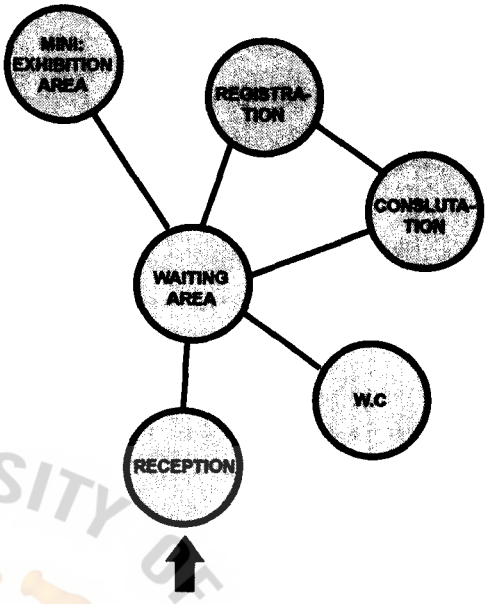
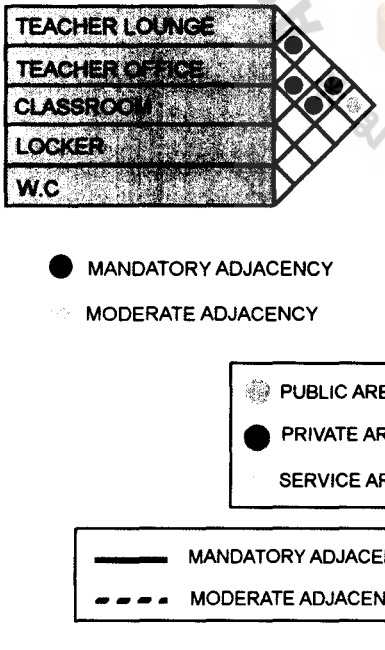


FIGURE 4.3.2 LOBBY AREA ADJACENCY MATRIX AND BUBBLE DIAGRAM

3. Teacher Office area Relationship Diagram



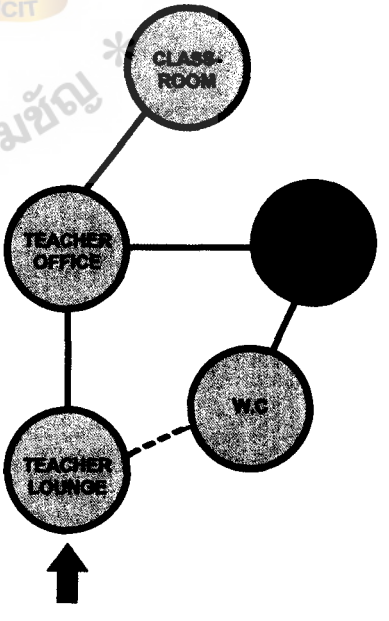


FIGURE 4.3.3 TEACHER OFFICE AREA ADJACENCY MATRIX AND BUBBLE DIAGRAM

4. Learning Area Relationship Diagram

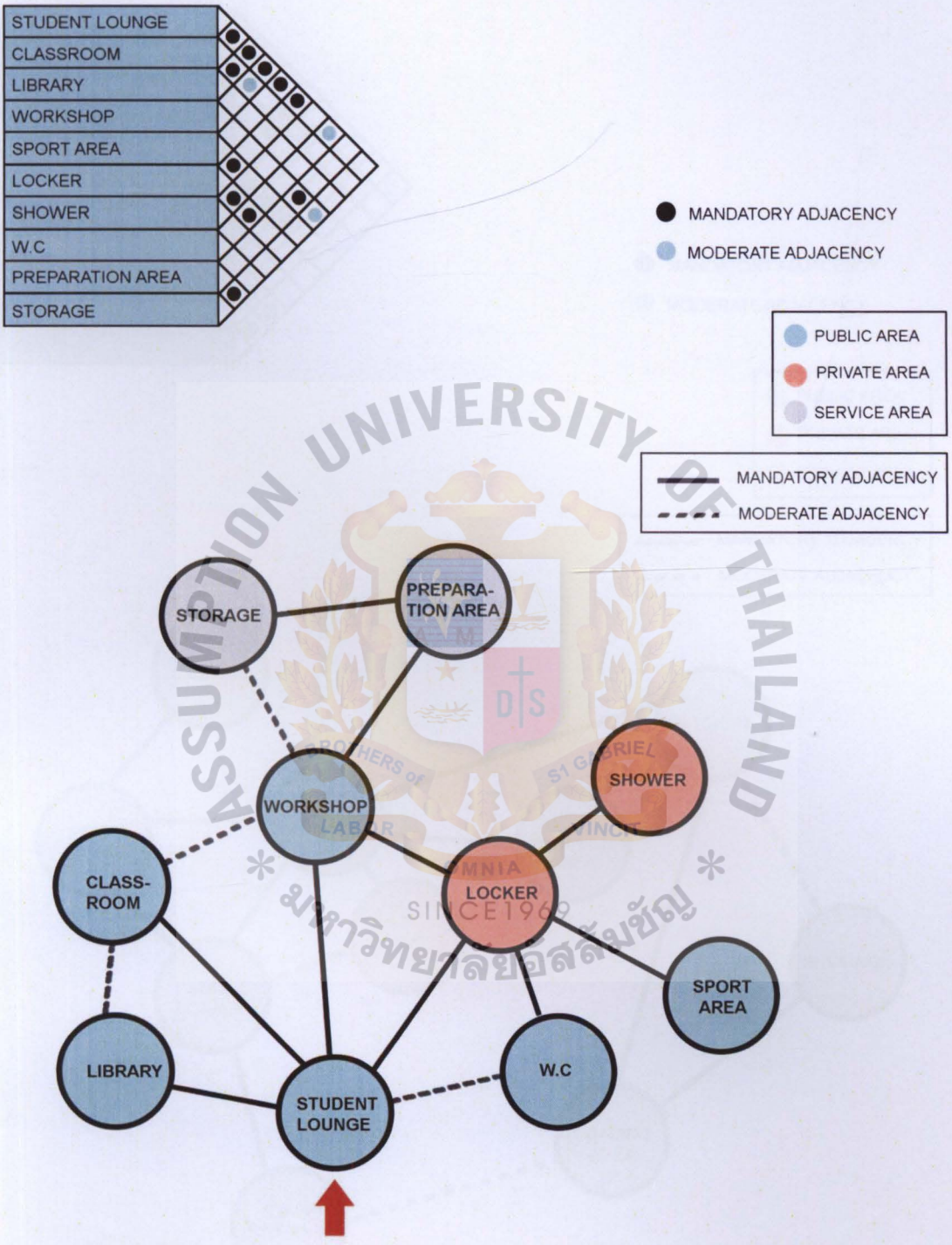


FIGURE 4.3.4 LEARNING AREA ADJACENCY MATRIX AND BUBBLE DIAGRAM

5. Back of House Relationship Diagram

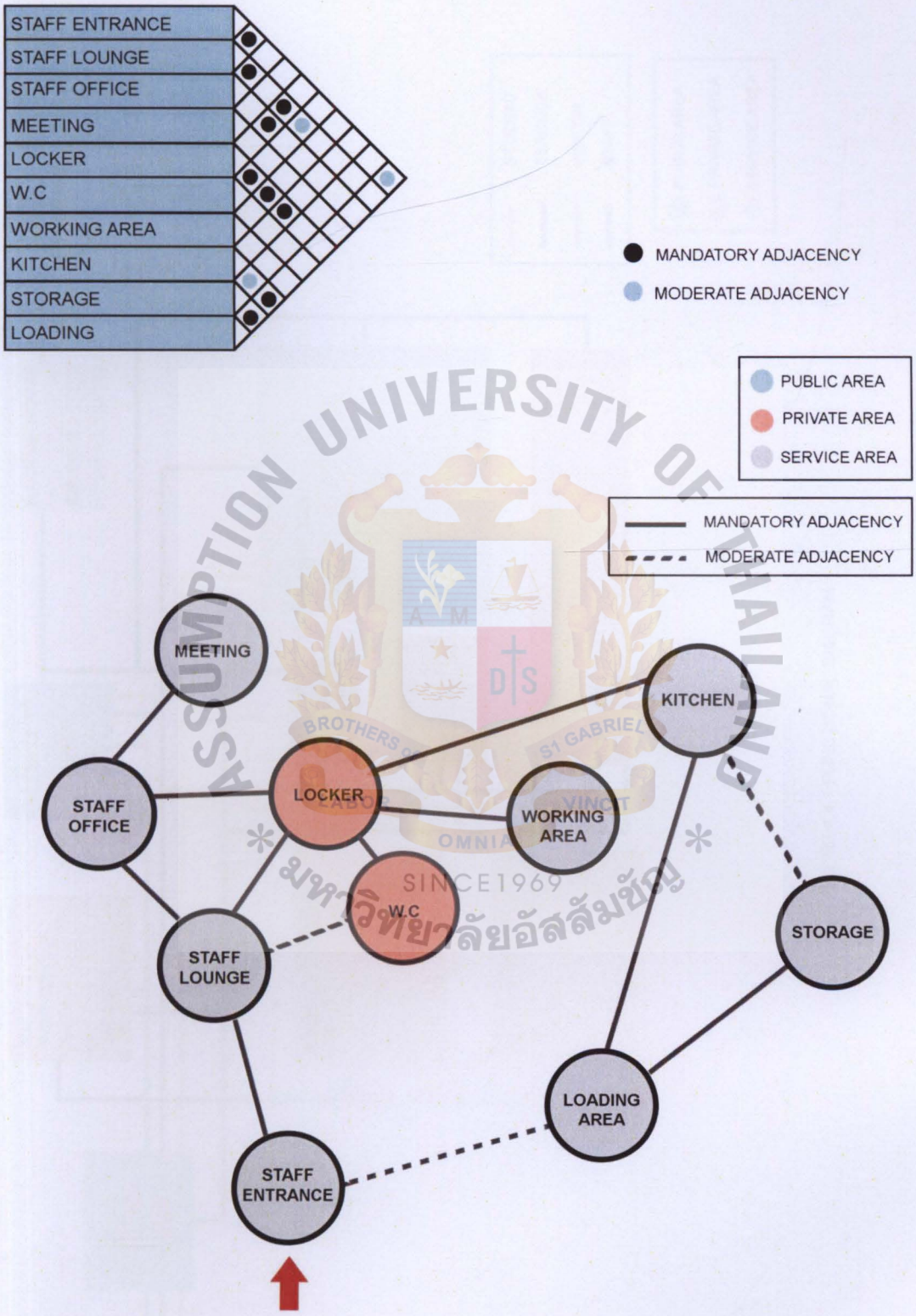


FIGURE 4.3.5 BACK OF HOUSE ADJACENCY MATRIX AND BUBBLE DIAGRAM

4.4 Functional Diagram and Proposed Zoning Study

4.4.1 Functional Diagram

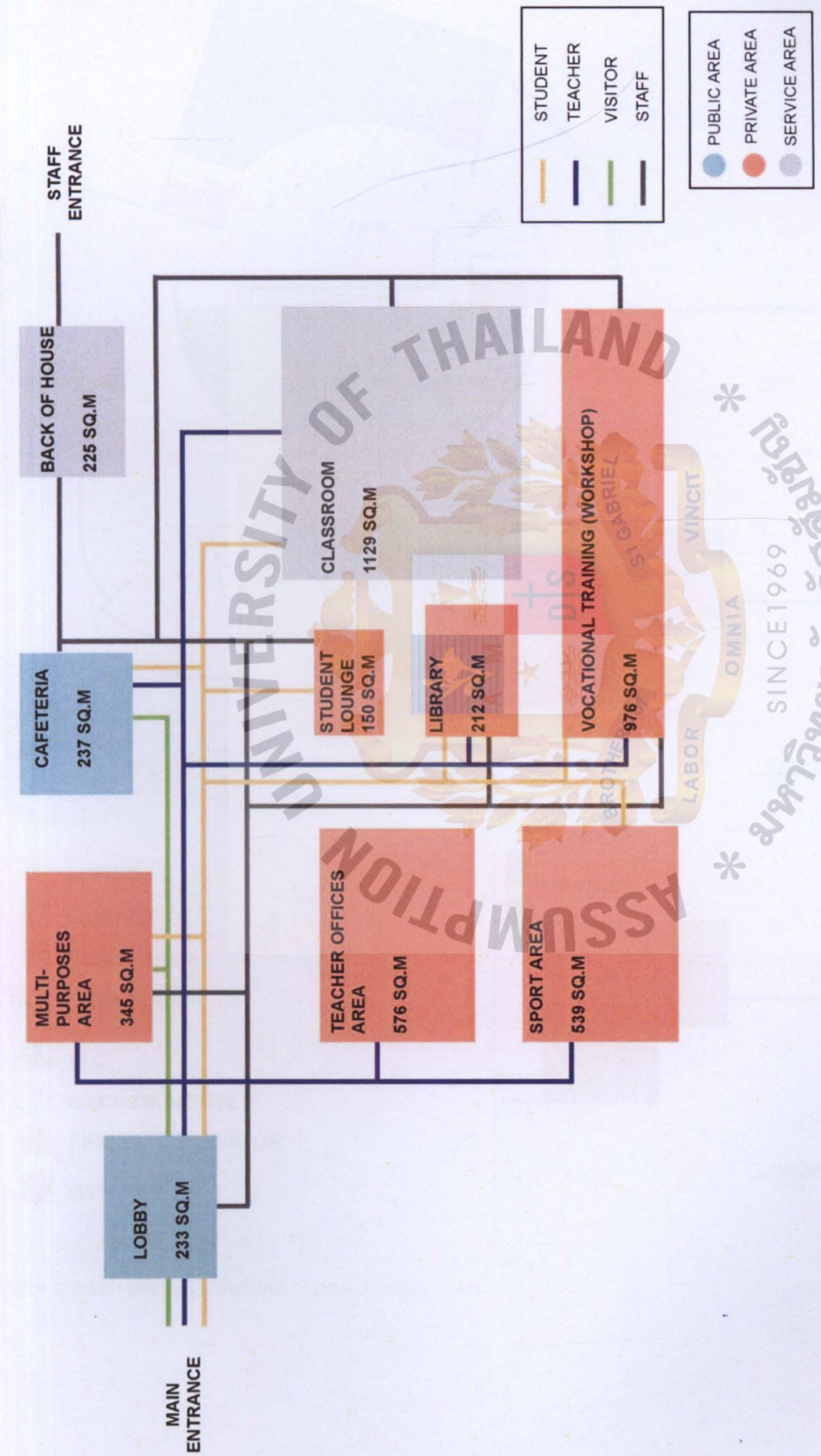


FIGURE 4.4.1 FUNCTIONAL DIAGRAM

4.4.2 Proposed Zoning Study

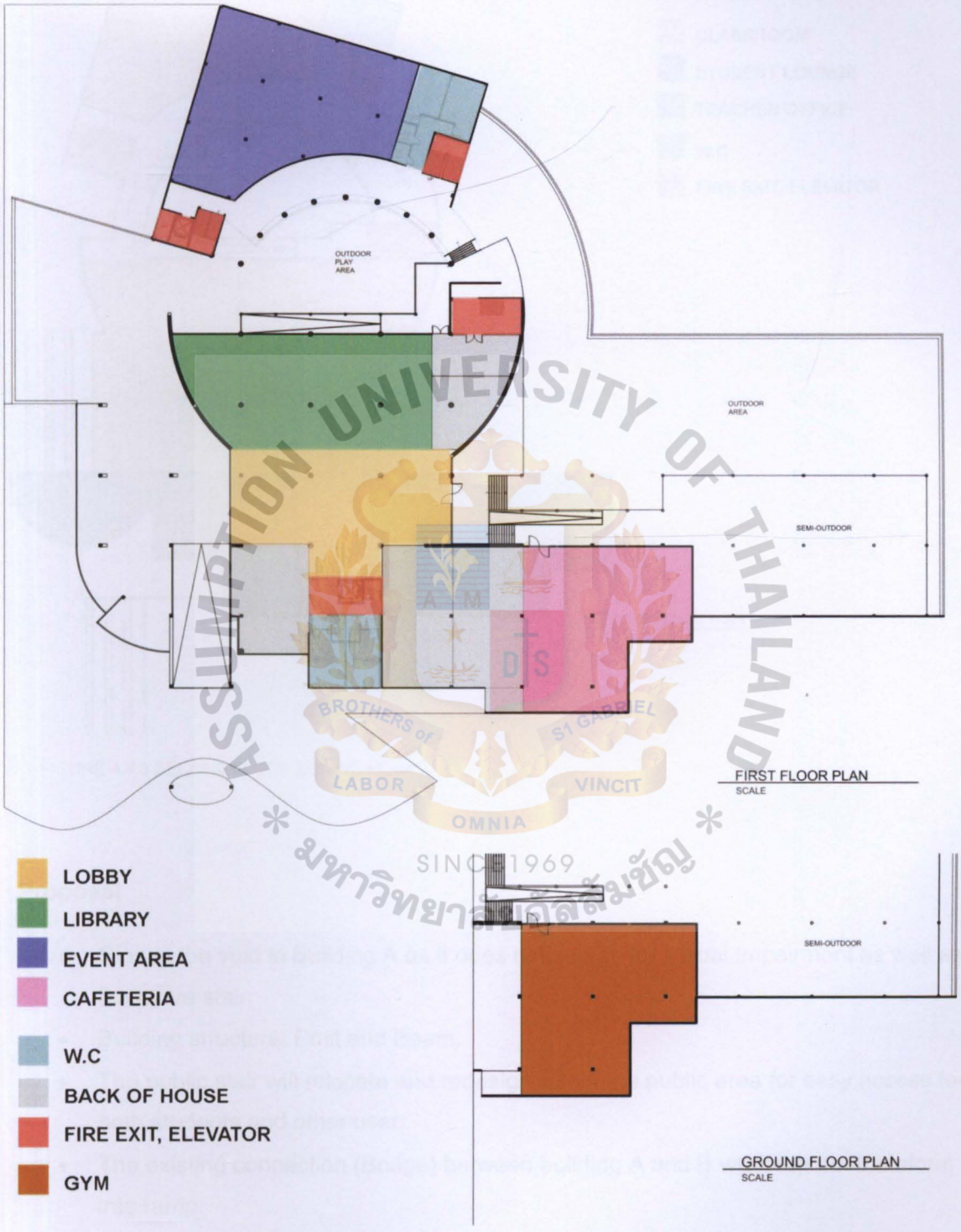


FIGURE 4.4.2 FIRST and GROUND FLOOR ZONING PLAN

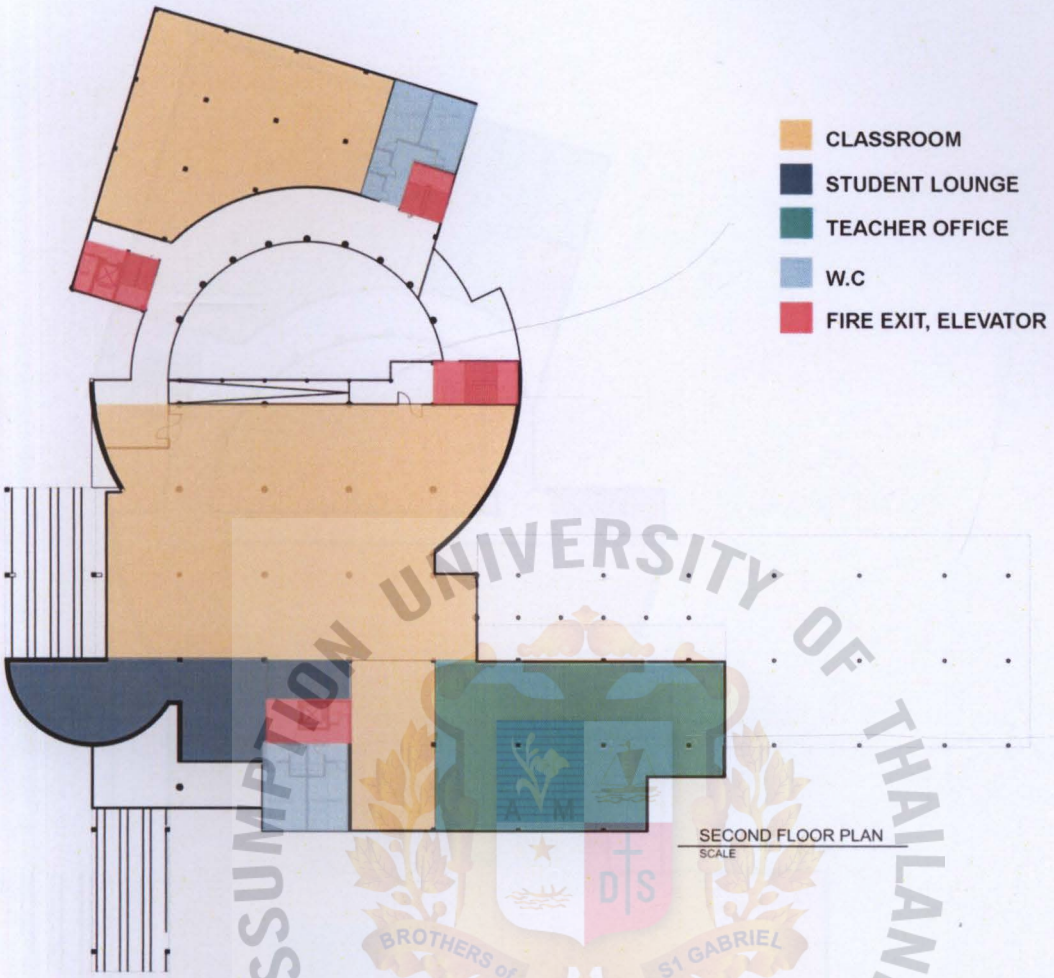


FIGURE 4.4.3 SECOND FLOOR ZONING PLAN

Proposal

- Closed the void in Building A as it does not serves for Visual Impairment as well as the curve stair.
- Building structure: Post and Beam.
- The public stair will relocate and redesign within the public area for easy access for both students and other user.
- The existing connection (Bridge) between building A and B will keep but transform into ramp.
- Existing fire exit stairs and elevators from both Building A and B are kept.

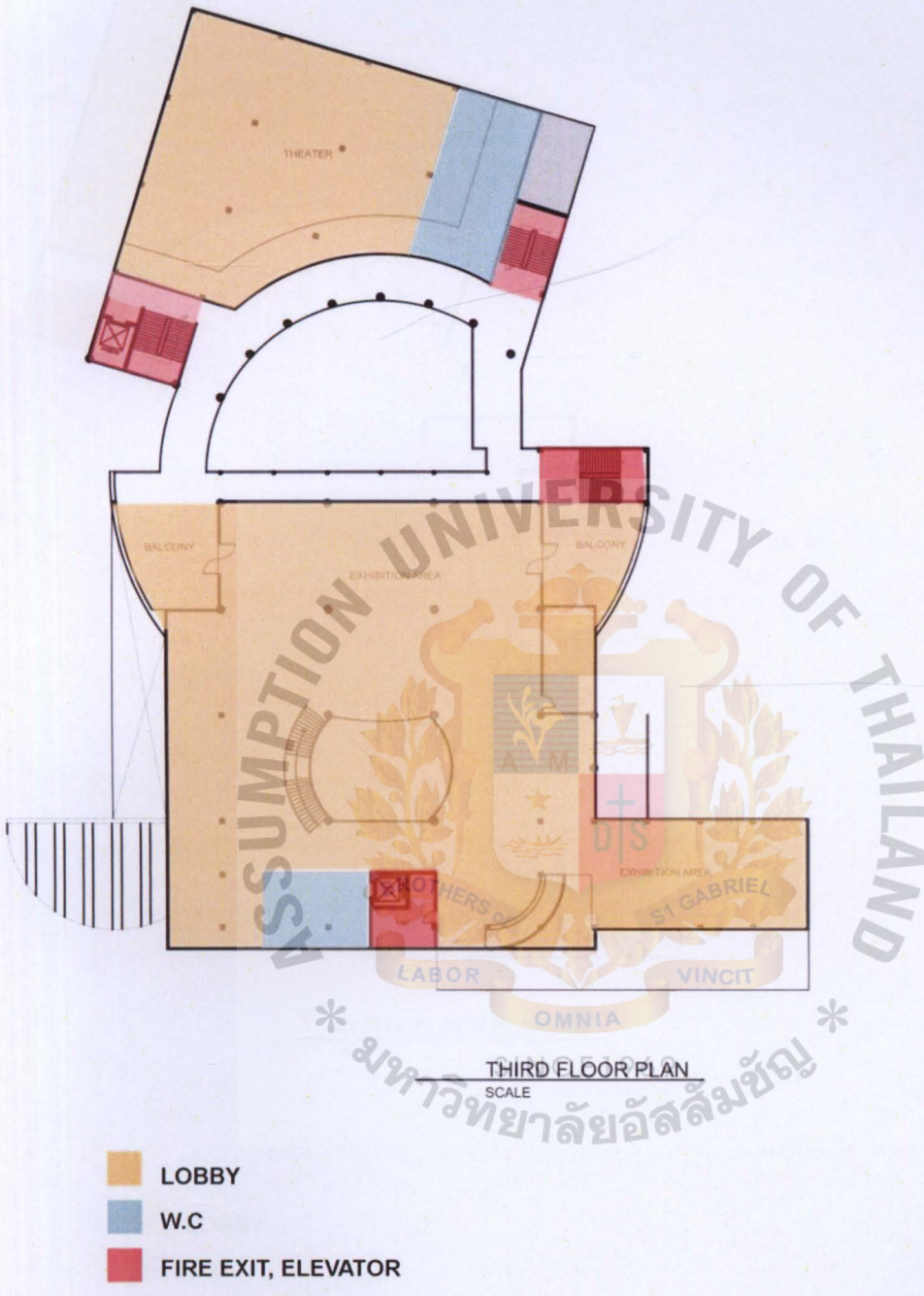


FIGURE 4.4.4 THIRD FLOOR ZONING PLAN

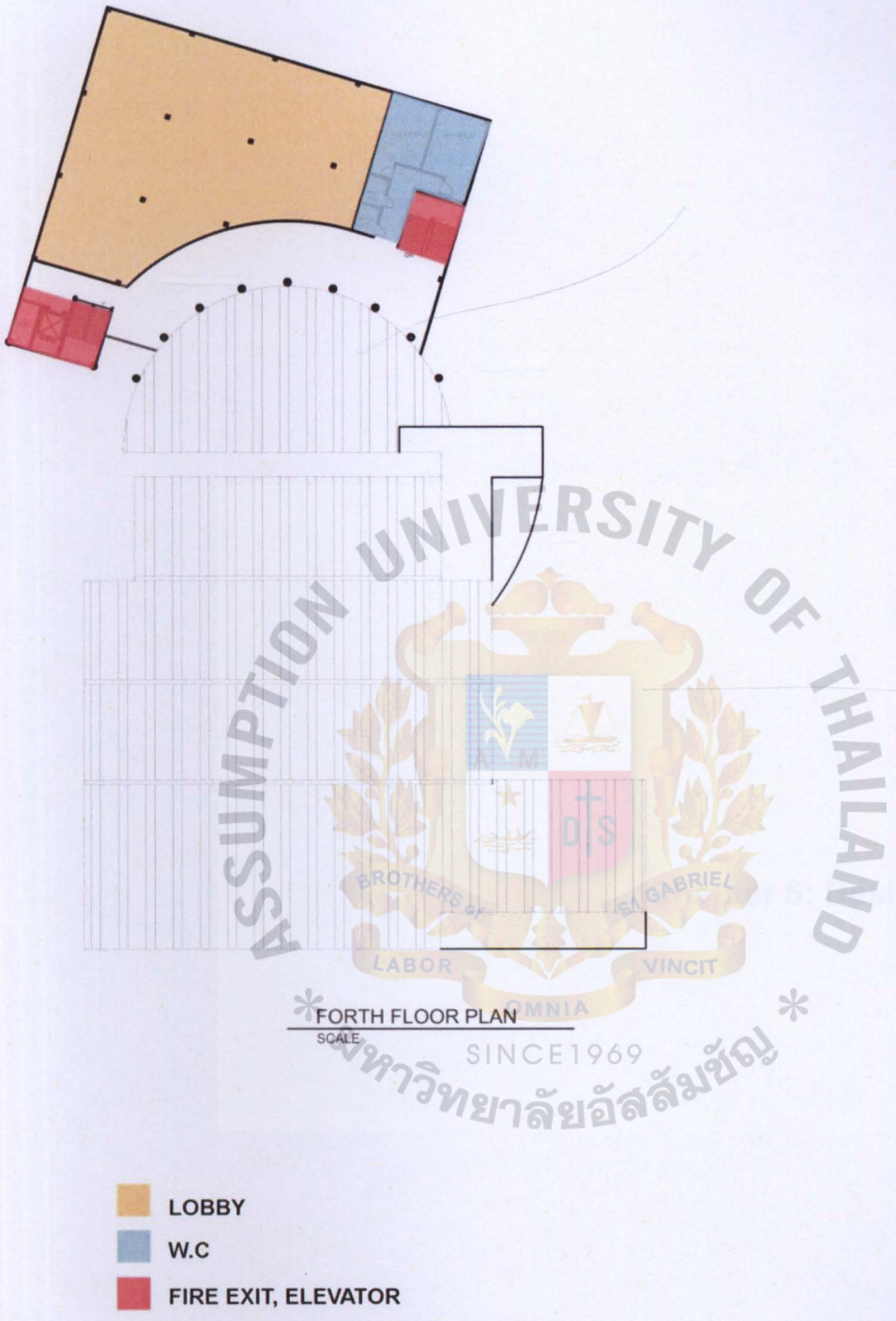


FIGURE 4.4.5 FORTH FLOOR ZONING PLAN

Chapter 5: Design Solution

Chapter 5: Design Solution

5.1 Design Concept

5.1.1 Design Statement

The concept is focusing on how important supporting senses and the environment for the visual impairment people, who lead to the experiences and feeling of the target users according the formal facts.

For people with visual impairment, everyday activity may have similar but the lack of vision gives them new experience every time they do that same activity. The reason is that for not having vision they have to depend on the other sense such as touch, hearing, smell and taste. Therefore, these senses give them different feeling according to the environment or the surrounding.

5.1.2 Concept Design Method

Sense play a very important role in the operating the daily activities for people with visual impairment. They serve as learning tool, communication media and navigating location and objects.

Besides, living in the secured environment give the visual impaired person a comfort and safe at mind which also provides self- reliant to the person alas well. For people who are blind or partially sighted, exploring every day and every activity with sense and experiencing in a secured place can provide them to explore surrounding and people.

FIGURE 5.1.1 CONCEPT DIAGRA

- For being visual disability, using other four sense, touch, sound, smell and taste, are crucial.
- Among them, TOUCH is a very effected and important sense for finding way and objects.
- For visual impairment, there are texture and braille serve for learning and communication.

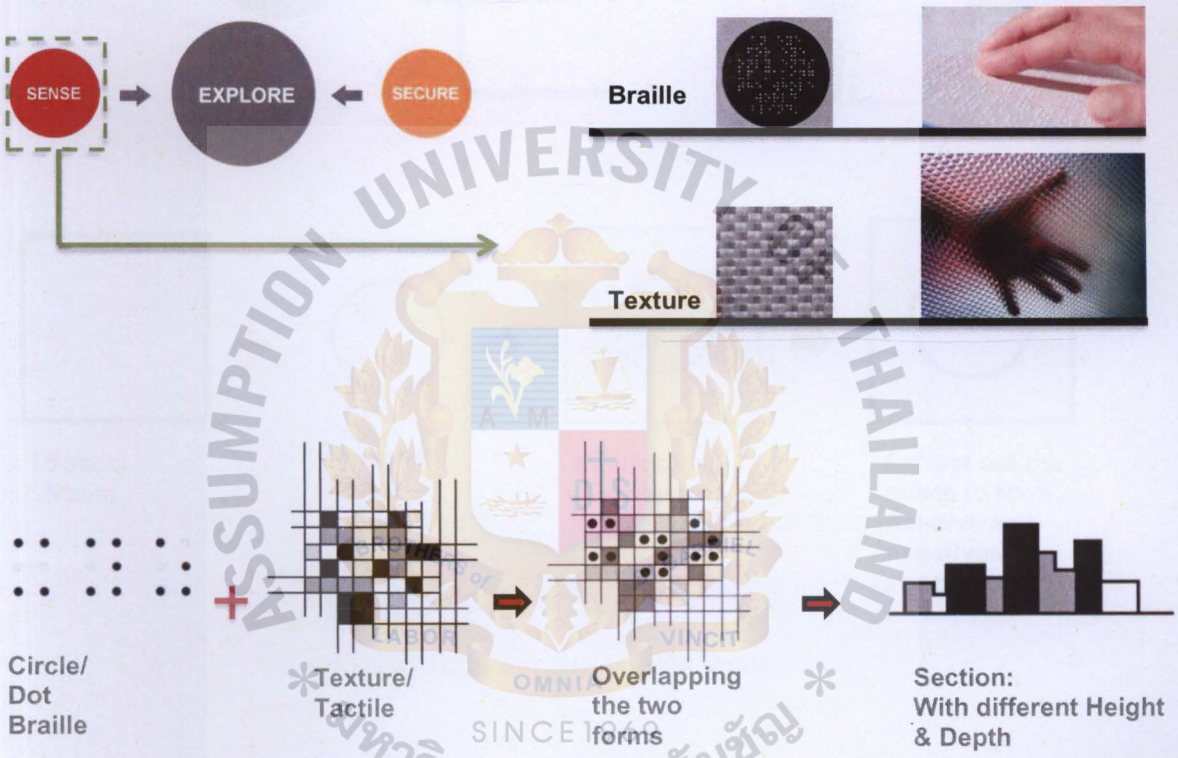


FIGURE 5.1.2 CONCEPT DIAGRAM FOR SENSE

- To have a significant texture, there are always different lever of depth and height.
- In the diagram, using the braille with the different tone to create various depths.
- Form and Shape: Geometric forms are always preferable for visual impairment as they are easy to memorize and recognize.

- When a person is in a close room/box, it presents as a safe place.
- For visual impairment, they required a large space for cane and clearance for personal space.

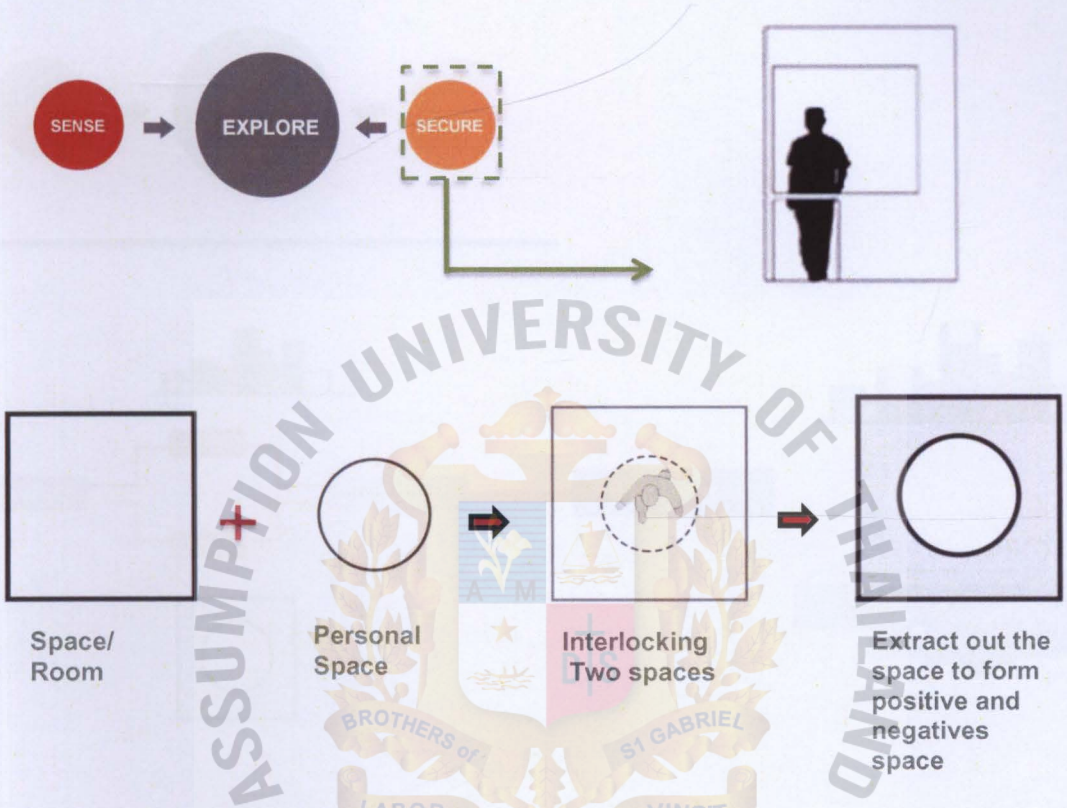


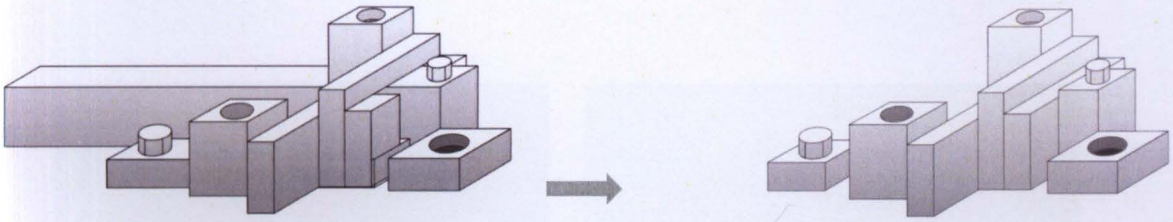
FIGURE 5.1.3 CONCEPT DIAGRAM FOR SECURE

"EXPLORING The Existence"

Explore the surrounding, people and activities in the safe and secured environment and learn the experiences of the youth despite the absence of vision.

FIGURE 5.1.4 CONCEPT DIAGRAM FOR EXPLORE

Development



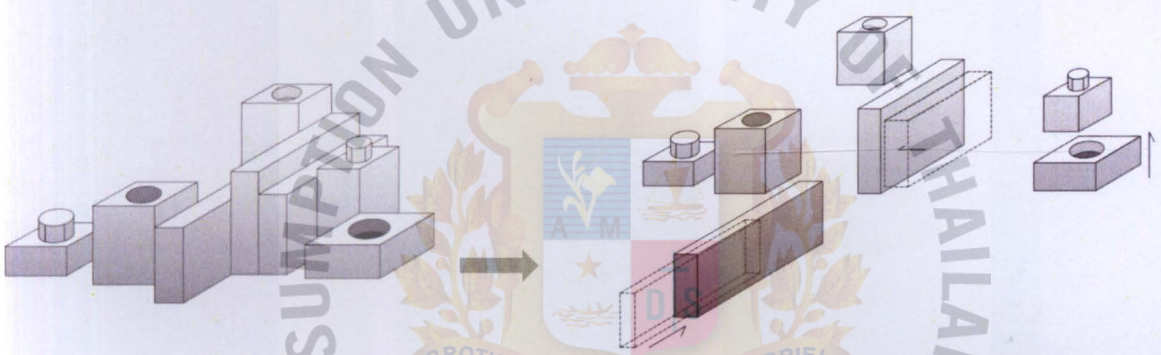
3D image of the concept of "Explore"

GO STOP

Take out the horizontal direction to give a clear direction to the user.

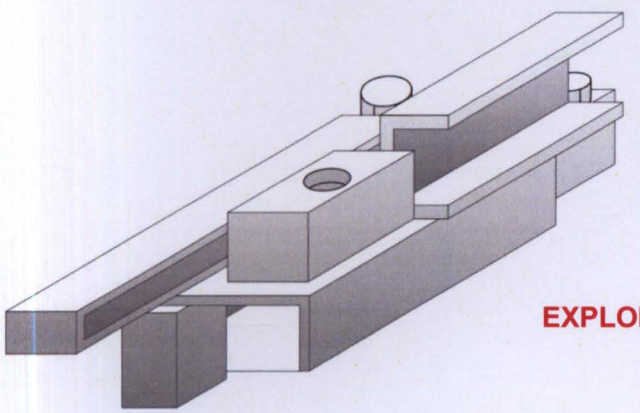
Floor Surface Tactile

"GO" & "STOP"



Extract the solid bar to create more space and volume which provide texture and different atmosphere to visual impairment.

Rearrange the element position to create different levels.



EXPLORE: Conceptual Model

FIGURE 5.1.5 CONCEPT DEVELOPMENT

Concept Model

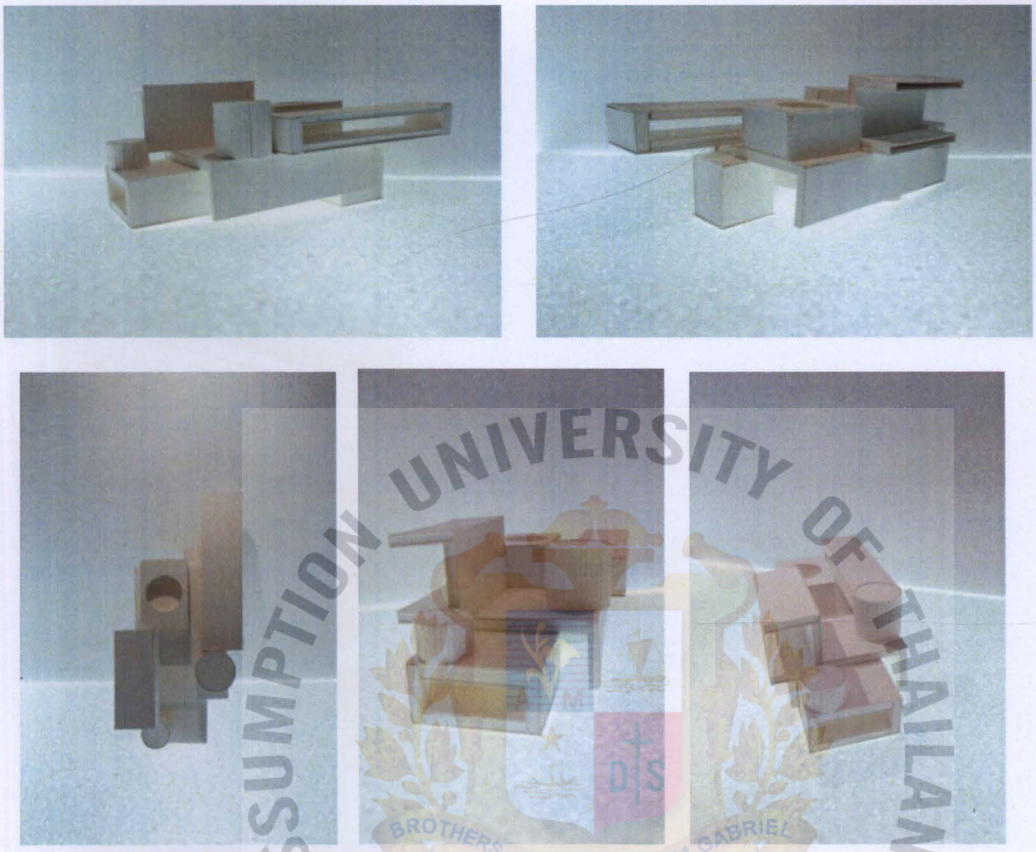


FIGURE 5.1.6 CONCEPT MODEL

Functional Solution

- **Circulation**

FIGURE 5.1.7 FUNCTIONAL SOLUTION: CIRCULATION

As the space is to serve for visual impairment student, the circulation has to be large enough for people with cane to walk around. Therefore, most of the walkway is designed into at least two meters which are large enough for two cane people to walk around.

Functional Solution

- **Sunlight**

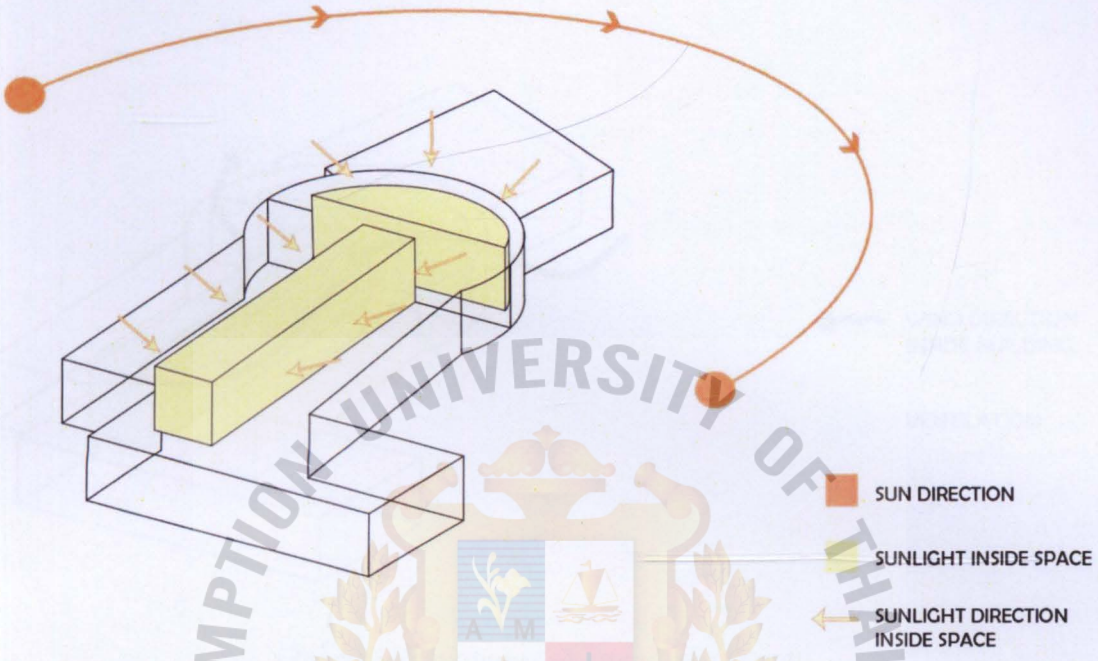


FIGURE 5.1.8 FUNCTIONAL SOLUTION: SUNLIGHT

There are void opened from 2nd to 3rd floor and follow by the skylight in the roof of the Building A, which provides natural sunlight to the corridor of the classrooms and create fresh and bright environment.

From the research, natural light is one of the essential lighting to the visual impairment; these opening void and skylight give necessary lighting to the target users.

Functional Solution

- **Ventilation**

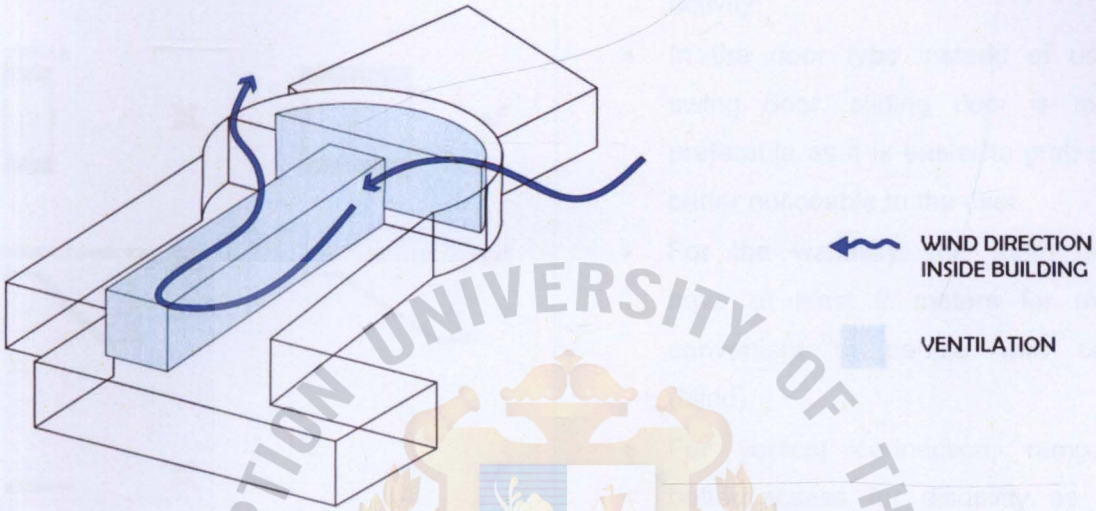
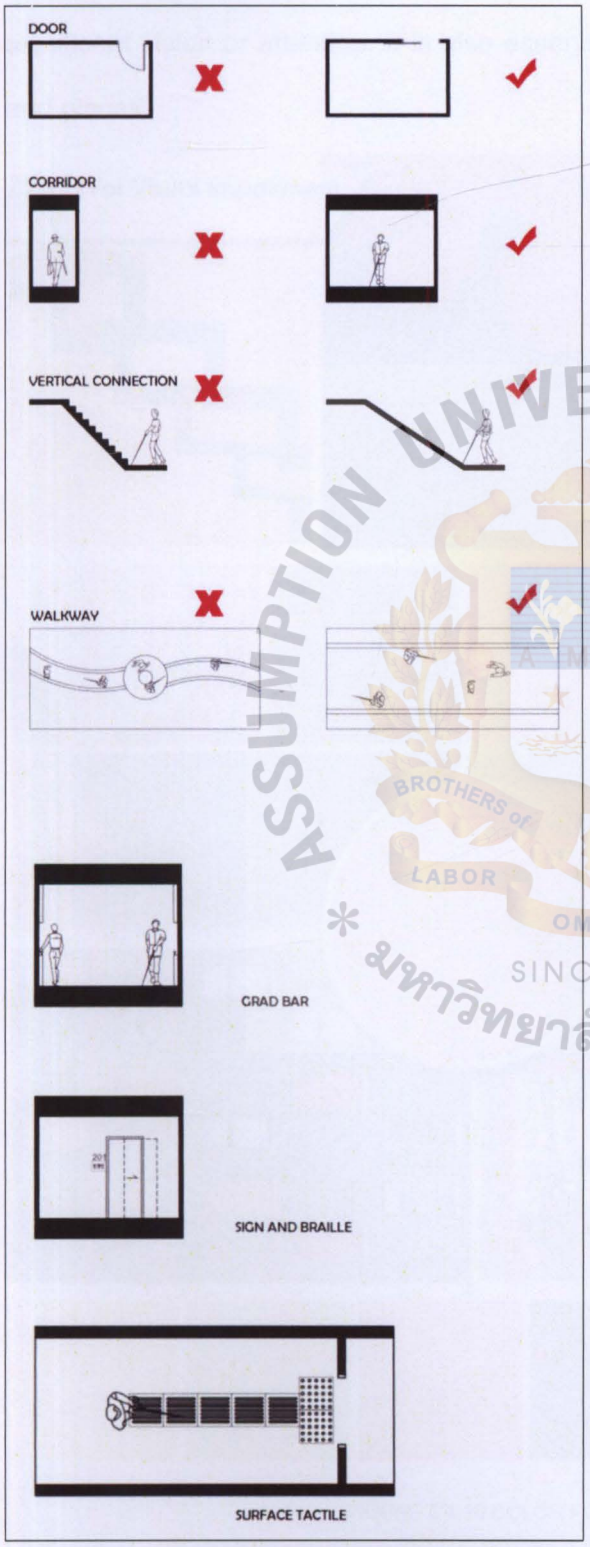


FIGURE 5.1.9 FUNCTIONAL SOLUTION: VENTILATION

From the opening void from 2nd to 3rd floor and skylight create ventilation path to the corridor area. Having better air ventilation is quite important to the visual impaired people as they are sensitive to the smell.

Functional Solution

- **Space and Direction**



- For visual impaired people, these are essential facts for them to do daily activity.
- In the door type instead of using swing door, sliding door is more preferable as it is easier to grab and better noticeable to the user.
- For the walkway, the width must have at least 2 meters for more convenient to people with cane (blind).
- For vertical connection, ramp is better access for disability as the user can walk up with less effort.
- The direction of the circulation must be liner which is much easier to detect the way.
- Providing grab bar in the circulation area with the direction sign is a helpful instruction to visual impairment.
- Moreover, attaching braille sign together with the actual written sign for example room number in front of the room or door is required for the user.
- The surface tactile on the flooring is required for people with cane (blind), as it will give direction sign to them especially in doorway, stair and elevator entrance.

FIGURE 5.1.9 FUNCTIONAL SOLUTION: SPACE & DIRECTION

Colors for Visual Impairment

Contrasted Color

For visual impairment, especially for low vision, color that contrasted delivers significant vision or attention. It is also essential that color give highlight and identify object and places.

FIGURE 5.1.10 COLOR FOR VISUAL IMPAIRMENT

5.2 Design Development

5.2.1 Planning

FIGURE 5.2.1 FIRST FLOOR FURNITURE LAYOUT PLAN

From the car parking to the main entrance of the building serves as the semi-outdoor area, foyer, for the gathering place for visitors, student and the staff.

From the foyer, to the entrance of the Building a connected to the Lobby area with reception attached to the staff administration office. In the Lobby, the seating are designed into liner with build-in lounge sofa interacted with table between seating which eliminate the obstacle to the users. Lobby is also attached to Library, Registration office, Consultation rooms and Cafeteria which serves to both student and staff also to visitors.

There is a Goal ball field between building A and B which is a semi-outdoor sport area. Across the Building B, 1st floor is a multi-purposes area for events and festivals.

1st floor serves as public area and connected to the outdoor area at the back of the building with swimming pool, gym area with yoga and physical exercise area in the ground floor of the Cafeteria.

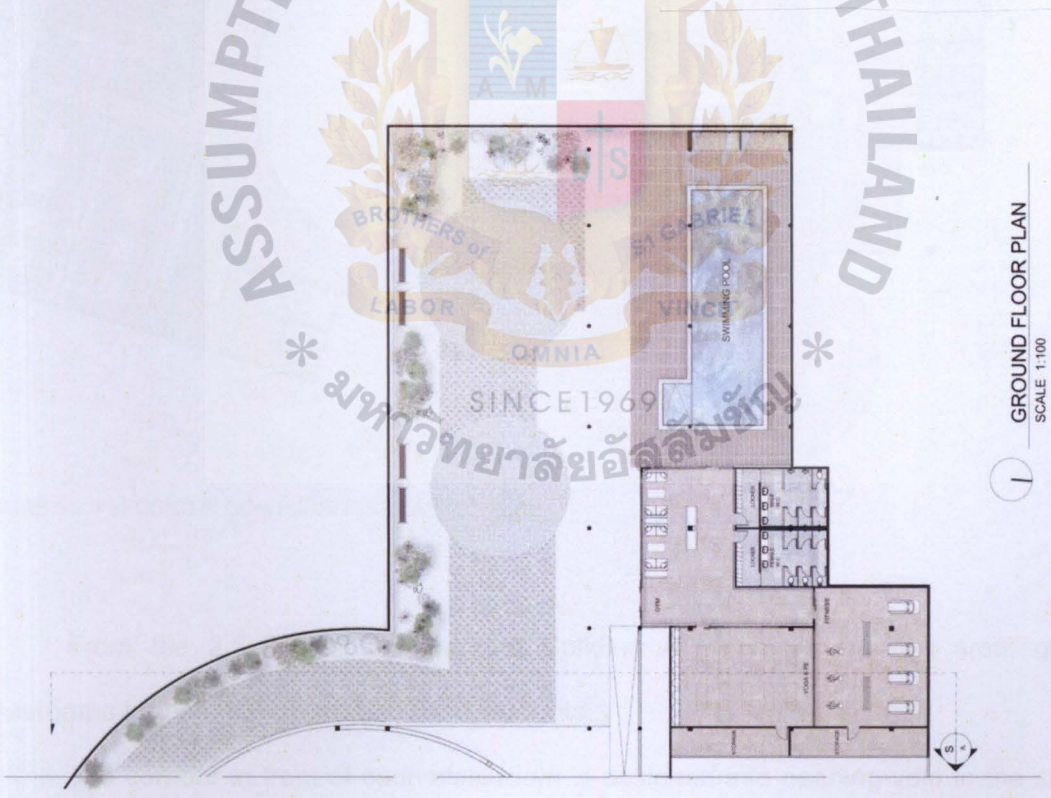


FIGURE 5.2.2 GROUND FLOOR FURNITURE LAYOUT PLAN

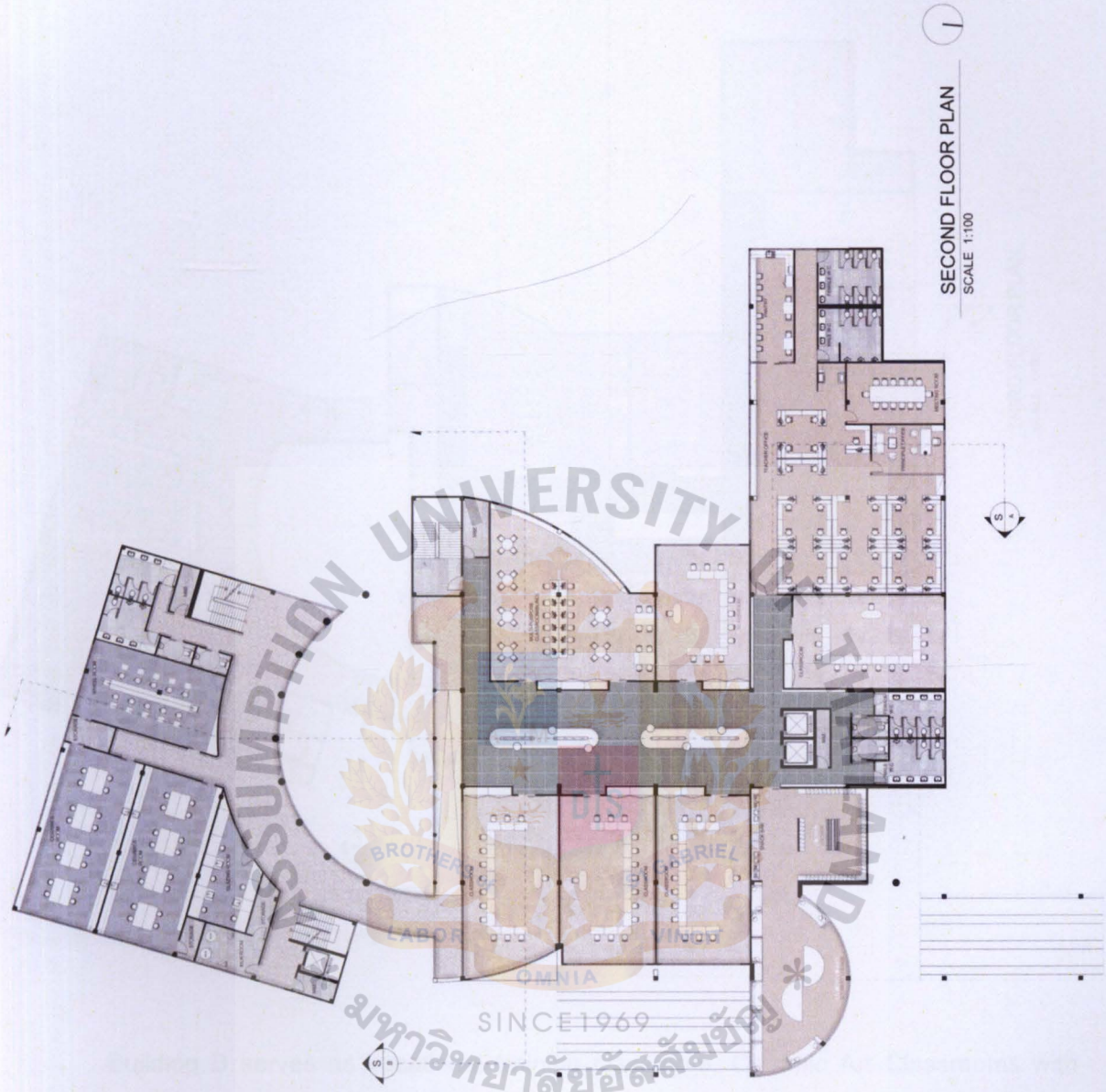


FIGURE 5.2.3 SECOND FLOOR FURNITURE LAYOUT PLAN

From the 2nd floor to 3rd floor of Building A serve as learning area, general classrooms for both low vision and blind students.

The corridor in front of each classroom is designed into opening void to the skylight to receive more natural light and better ventilation to the space.

Building A and B are connected with the bridge with ramp as there is a difference in height of each building.

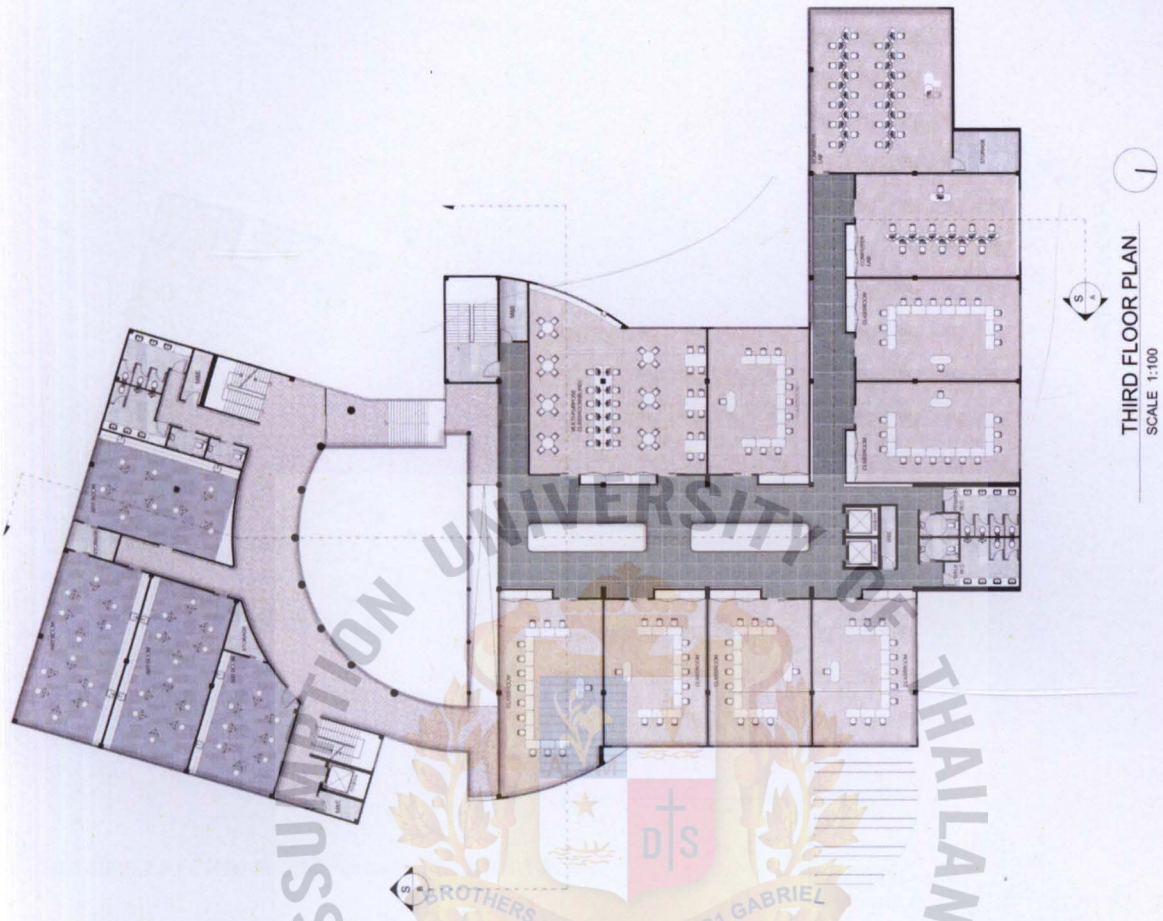


FIGURE 5.2.4 THIRD FLOOR FURNITURE LAYOUT PLAN

Building B serves as vocational training classroom, Ceramic Art Classrooms with ceramic room, wheel room, kiln room and glazing room with washing sinks inside each classroom for cleaning.

Repeated Layout Plan in the 3rd floor from the 2nd floor as it is easier memorization for the visual impairment students. However, in the Building B the vocational training classroom serves as Art Classroom for painting and drawing.

F

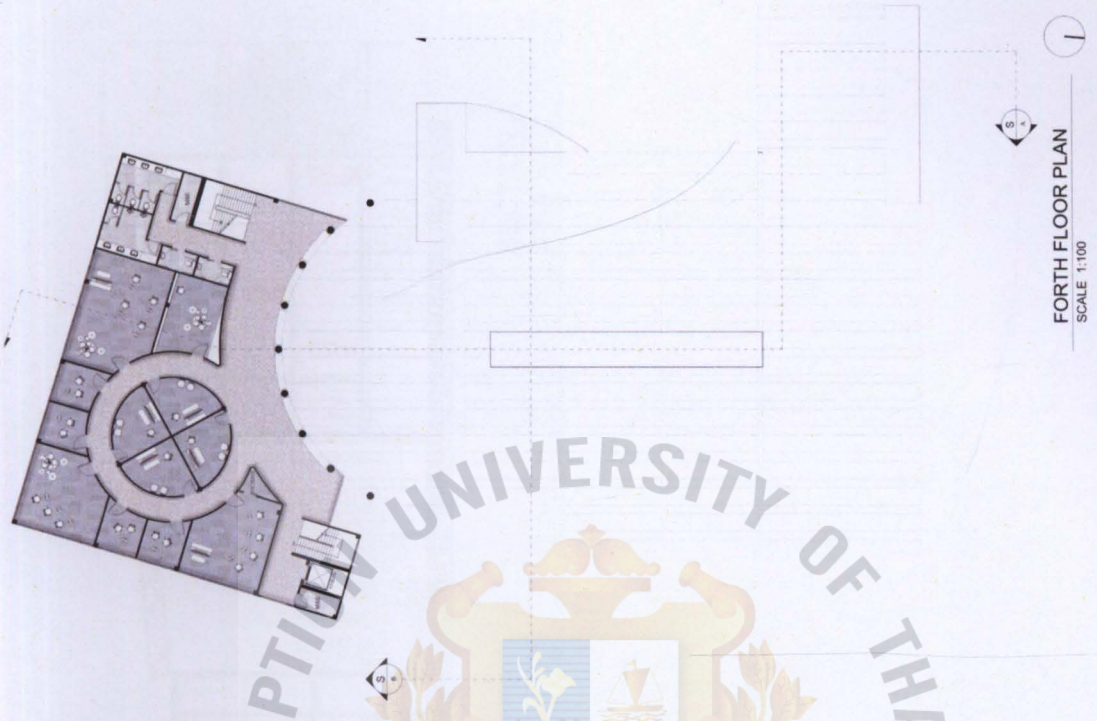


FIGURE 5.2.5 FORTH FLOOR FURNITURE LAYOUT PLAN

For the 4th floor in the Building B serves as Music Classroom with both private practice room and group practice room. In the Building B, the corridor is continues from the bridge of Building A, therefore, it is a semi-outdoor area and provide better ventilation and also connected to the outdoor area.

5.2.2 Design Scope Development

Sections Design: Section Color Rendering

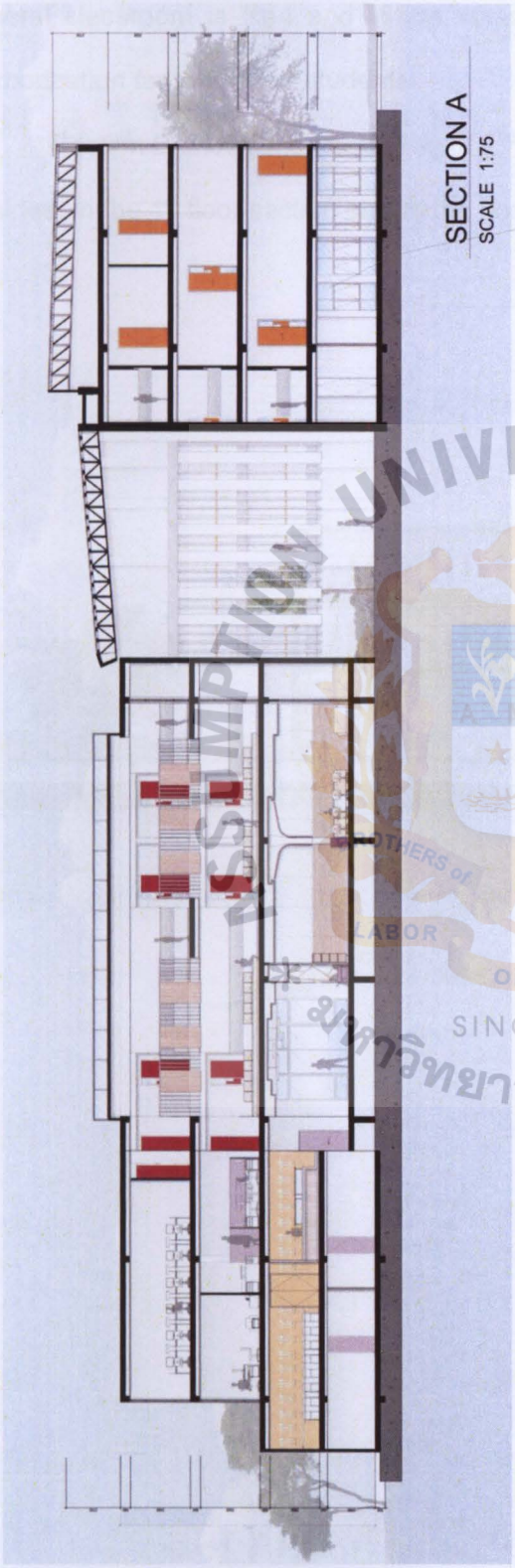


FIGURE 5.2.6 SECTION A

Section A cut through the vertical of both Building A and B, to show the opening void, skylight, semi-outdoor area/ bridge connecting both buildings. The color used in the general classroom is Red and in the vocational classroom is Orange which is for easy memorization for low vision students.

Section B shows the interacting of 2nd and 3rd floor in Building A with the classrooms. Besides, in the 1st floor section shows the floor height of the Library and the Corridor.

FIGURE 5.2.7 SECTION B

Planning Design: Reflected Ceiling Plan

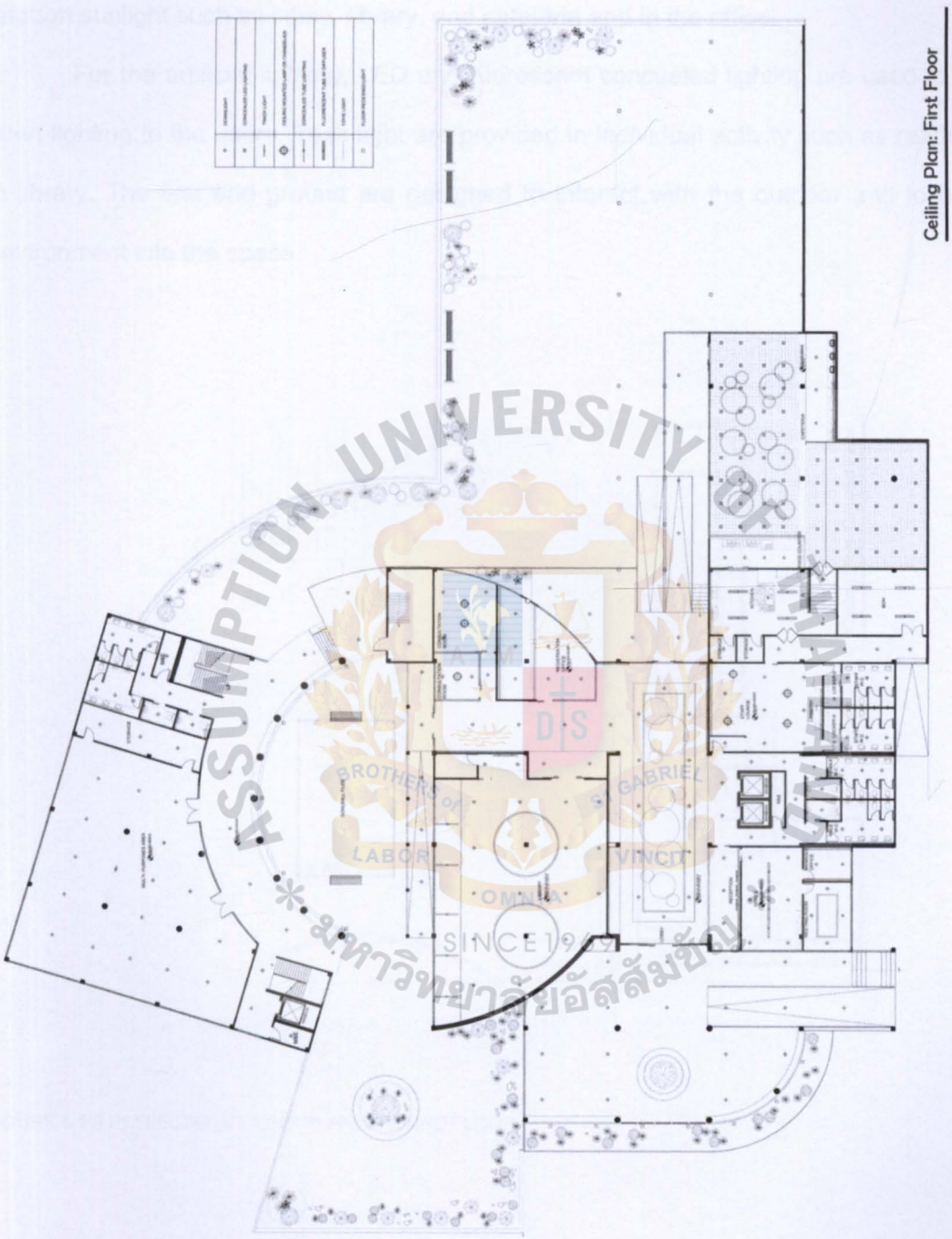


FIGURE 5.2.8 REFLECTED CEILING PLAN: 1ST FLOOR

As it is a school for visual impairment, lighting plays an important role. Especially, natural light is preferable for the target user; most of the main areas are designed to get enough sunlight such as lobby, library, and cafeteria and in the office.

For the artificial lighting, LED and Florescent concealed lighting are used to provide even lighting to the users. Task light are provided in individual activity such as reading area in library. The first and ground are designed to interact with the outdoor and to bring the environment into the space.

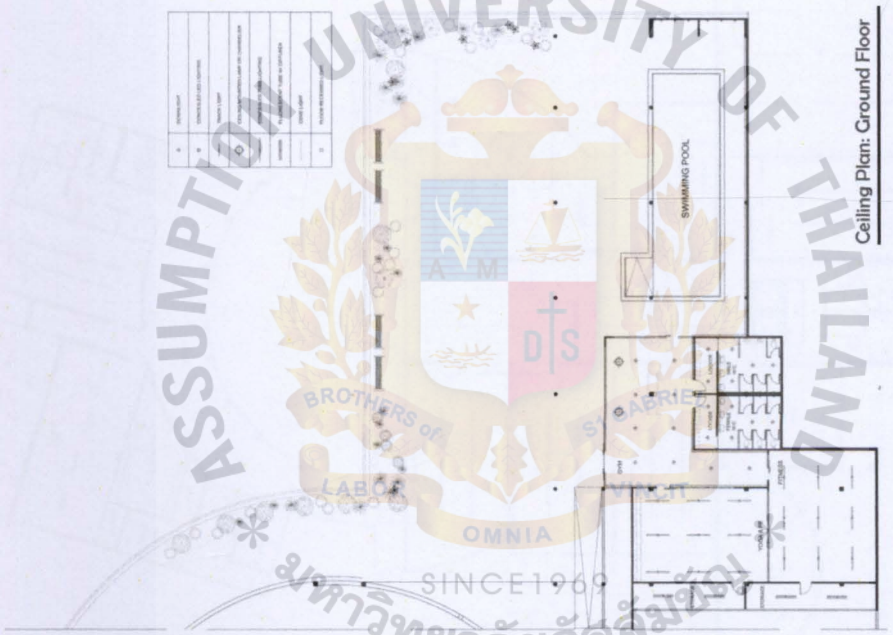


FIGURE 5.2.9 REFLECTED CEILING PLAN: GROUND FLOOR

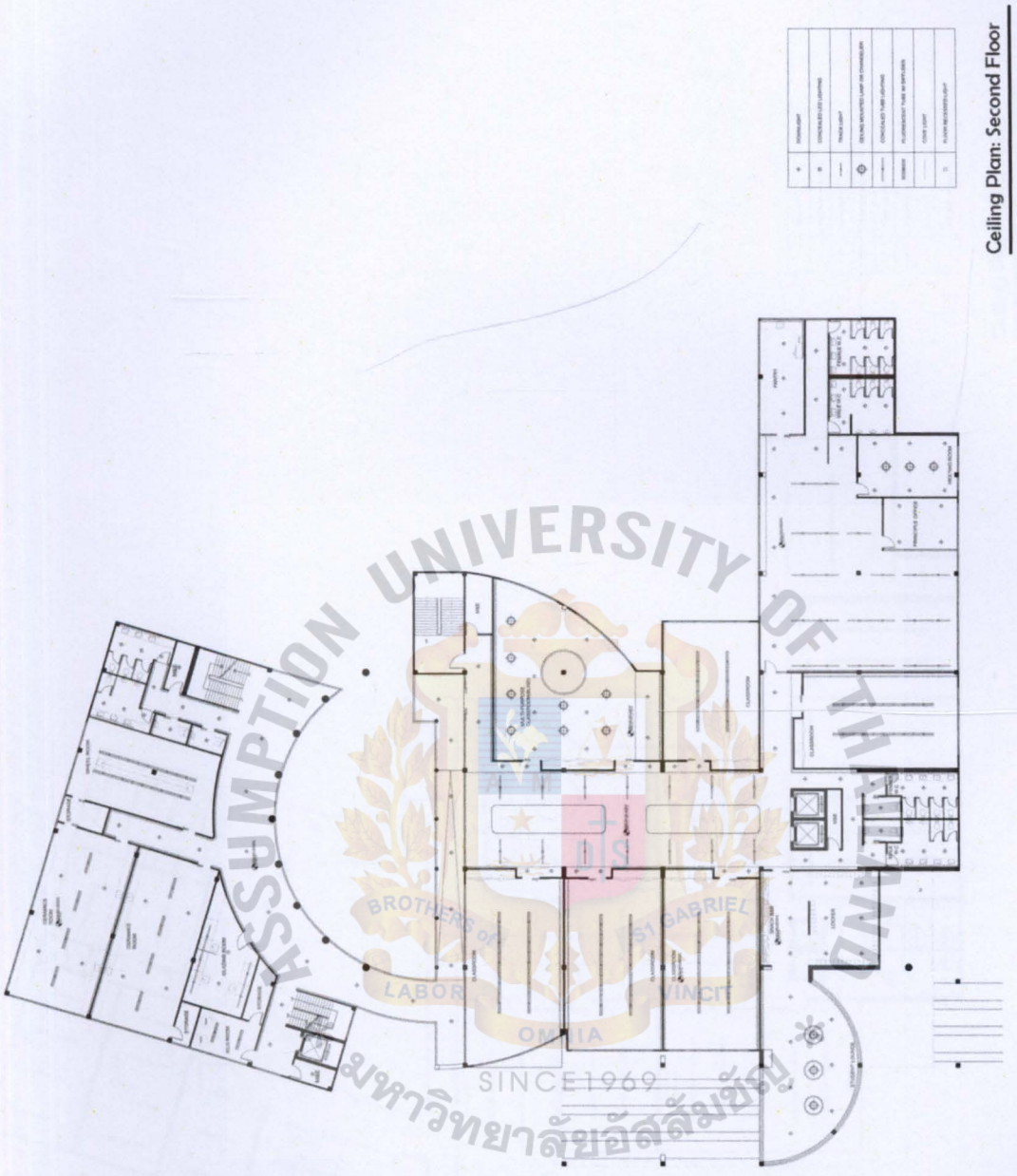


FIGURE 5.2.10 REFLECTED CEILING PLAN: 2nd FLOOR

For 2nd, 3rd and 4th floors are learning area, Suspended Florescent Tube and Florescent concealed lighting are used in the classroom and in the corridor. Most of the classrooms are connected to the outdoor to give natural lighting.

In the corridor of 2nd to 3rd floor have opening void to the skylight to get enough sunlight into the space.

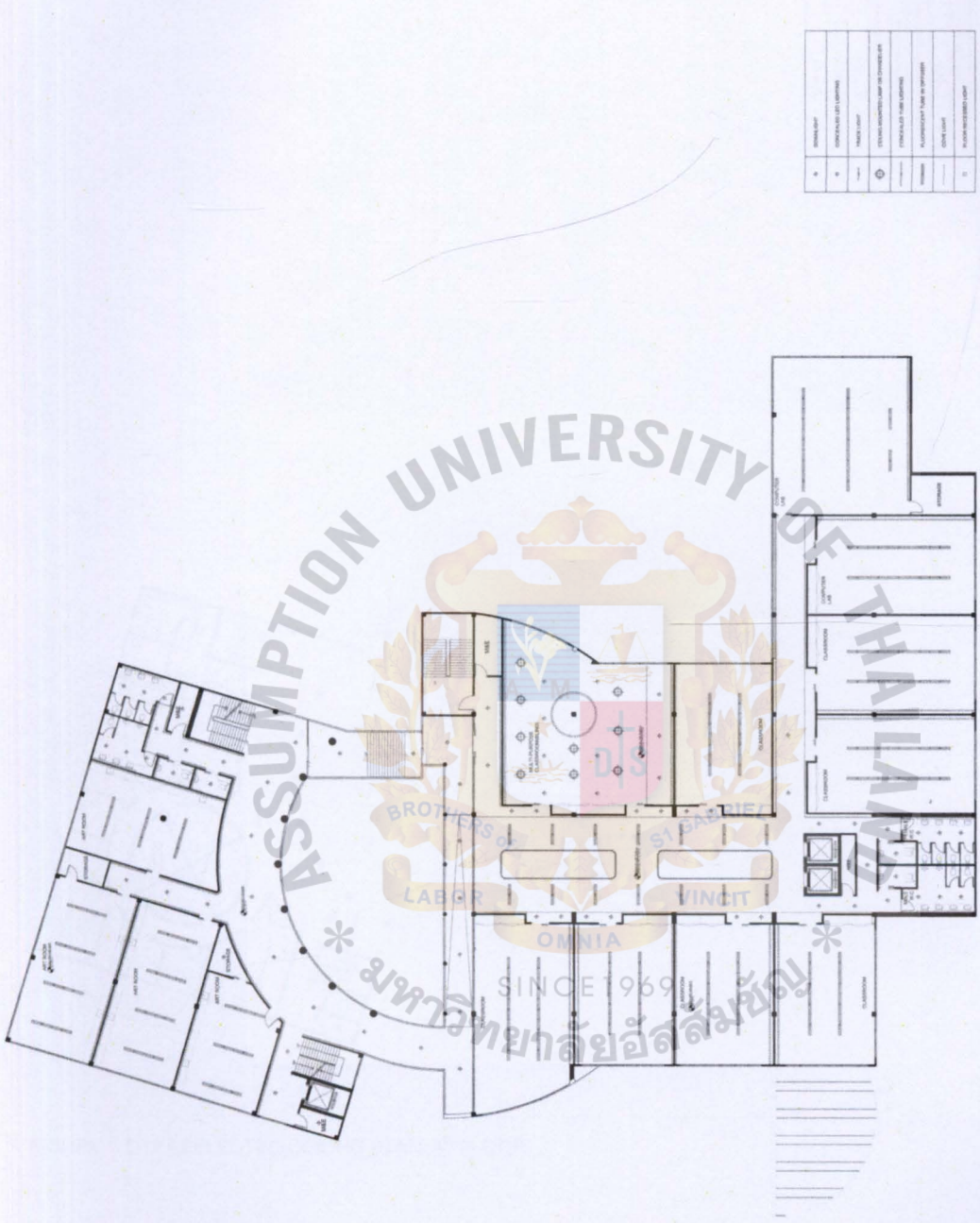


FIGURE 5.2.11 REFLECTED CEILING PLAN: 3rd FLOOR

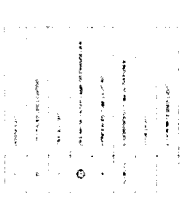


FIGURE 5.2.12 REFLECTED CEILING PLAN: 4th FLOOR

Perspectives: Interior Perspective Renderings

Façade

The façade of the school is created with the foyer and the colors of the windows from both general classrooms (red) and vocational classrooms (orange).

The colors and the form of the foyer and outdoor create friendly and natural environment for the visitors.

FIGURE 5.2.13 FAÇADE PERSPECTIVE

FIGURE 5.2.14 FAÇADE PERSPECTIVE

Foyer

Foyer, the semi-outdoor area right before the entrance of the building and to create a gathering place for students, staff and visitors. There are three opened circle void which create interacted space for both indoor and outdoor space.

The middle of the void is designed as a seating area with tree and plant inside and gives a natural environment.

FIGURE 5.2.15 FOYER PERSPECTIVE

Semi-outdoor Goal ball Field/ Bridge

This perspective shows the connection between Building A and B which is above the semi-outdoor goalball field. The walkway on the bridges have long handrail to give direction guide to the user with yellow color which is designed as public space. Moreover, the walkways are cover vertically with strip pattern to prevent users to fall off from the bridge.

FIGURE 5.2.16 GOALBALL FIELD

Lobby

In the lobby, reception and waiting area is designed to be aligned with each other, especially for seating area is designed in a long liner seating lounge interacts with tables between to eliminate obstruction for people with cane (blind).

In the front of reception counter is placed with surface tactile to give direction for legal blind. The contracted colors of yellow and purple are assigned in the public area to give clear direction to the user with low vision, especially in the grab bar area giving vivid contract.

FIGURE 5.2.17 LOBBY, RECEPTION AND WAITING AREA

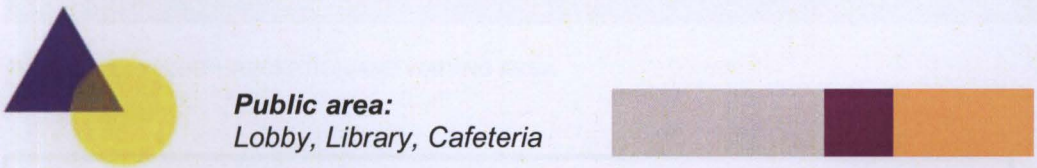


FIGURE 5.2.18 COLOR SELECTION FOR LOBBY AREA

FIGURE 5.2.19 LOBBY, RECEPTION AND WAITING AREA

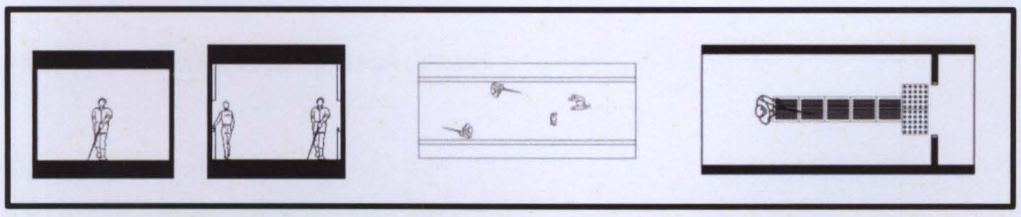


FIGURE 5.2.20 FUNCTIONAL SOLUTION IN LOBBY AREA

Library

Library is attached to the lobby area and serves so public area for bath students, staff and visitors.

Applied the same color contracted as it is public area. There is reading area with formal seating and casual seating and furniture are carefully selected with soft upholstery to prevent form harming to the users. Mixing yellow and purple with other neutral colors to create warm and fun environment to the users.

FIGURE 5.2.21 LIBRARY

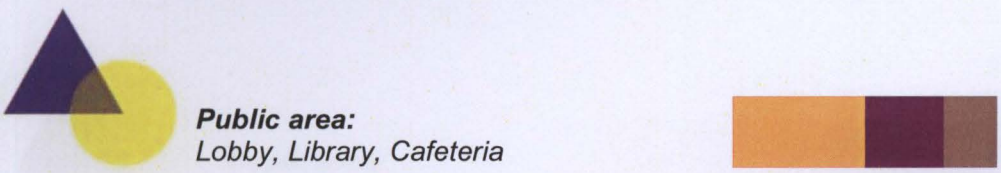


FIGURE 5.2.22 COLOR SELECTION FOR LIBRARY

Cafeteria

Cafeteria is in the easy access from the lobby area to serve to not only students but also the visitors.

Grab bar are placed around the wall and walkway of the cafeteria to give direction to the user from the entrance, food service counter and to the seat. The chair with backrest is chosen as it gives an easier access to the visual impairment.

As there is only 300 cm including the structure beam from the floor, exposed ceiling is used and cover with grid bar to give higher environment rather using closed ceiling.

FIGURE 5.2.23 CAFETERIA

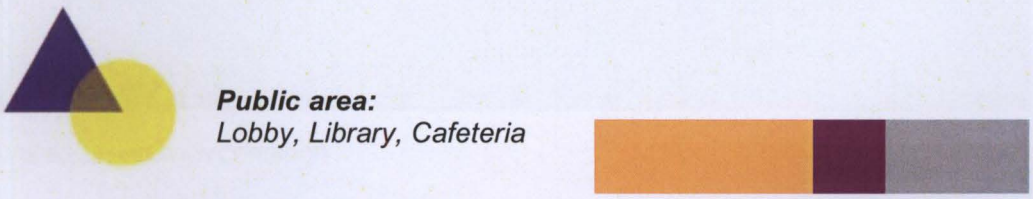
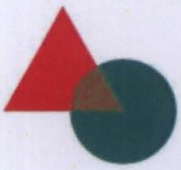


FIGURE 5.2.24 COLOR SELECTION FOR CAFETERIA

Hallway/ Corridor

The corridor in front of classrooms in 2nd and 3rd floor is connected with opened void to the skylight. The reason is to let the natural light inside the space and to get better ventilation.

FIGURE 5.2.25 HALLWAY/ CORRIDOR



Learning area:
Classroom, Hallway

FIGURE 5.2.26 COLOR SELECTION FOR GENERAL CLASSROOMS AND HALLWAY

Grab bar are located in the both sides of the walkway to give guiding support to users. The handrails on the void are 150 cm high from the floor and designed with wooden and white vertical panels to give a clear vision and to protect the students from falling especially for legal blind. As it is in the learning area, red and green are chosen to give contracted colors as well as easy memorization to the student.

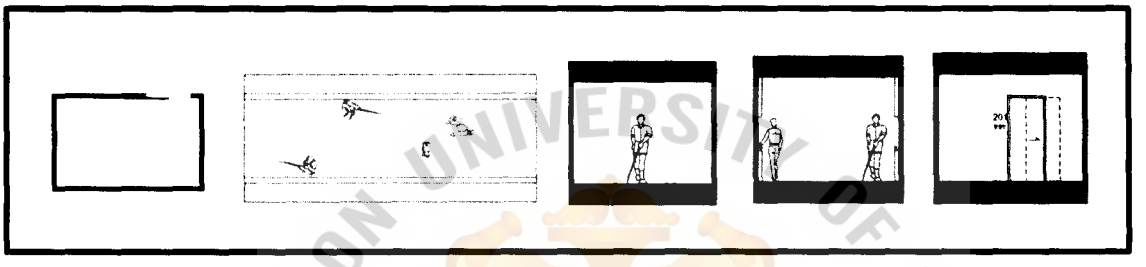


FIGURE 5.2.27 FUNCTIONAL SOLUTION IN LEARNING AREA

Classroom

The general classrooms are divided into classrooms for low vision and blind. For the student with low vision they can learn just as normal student with group of students in the private classroom. However, the arrangement of the furniture must not be more than two rolls due to their vision. Therefore, the furniture are arranged into U-shaped with one roll that the students from any seat can have the same view to the blackboard.

The blackboard is used as it does not create glare and reflection. Also for the table topped are grey to avoid glare. At the back wall of the classroom is designed into to interacting learning tool which movable world map and other sign to let the students to touch and experience with the lessons.

Acoustics ceiling are used to give insulation for sound as hearing is one of the primary supporting sense to the visual impairment.

FIGURE 5.2.28 GENERAL CLASSROOM

FIGURE 5.2.29 GENERAL CLASSROOM

FIGURE 5.2.30 COLOR SELECTION FOR GENERAL CLASSROOMS AND HALLWAY

Multi-classroom for Blind

Classrooms for legally blind are different from the low vision as they cannot see completely, therefore, the furniture are arranged into small group such as one teacher for 2 to 3 students to handle and each them. In this classroom, there are not only learning area but also computer lab is combined to give better teaching tool to the teacher.

At the back wall of the classroom is also designed with braille board with movable and touchable for the students to have experience with sign.

FIGURE 5.2.31 MULTI-CLASSROOM FOR BLIND

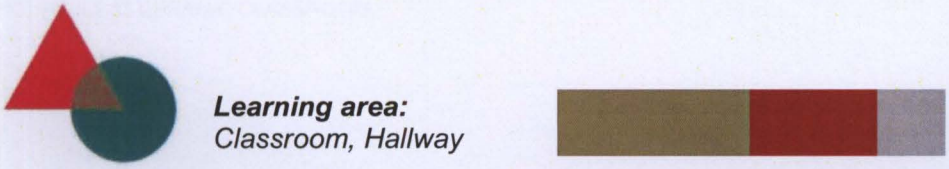


FIGURE 5.2.32 COLOR SELECTION FOR GENERAL CLASSROOMS AND HALLWAY

Vocational Classroom

Ceramic Art Classroom

The classroom is designed with fixed furniture as the students deal with ceramic and clay which are quite heave material. Besides, chair with backrest are chosen to give a better access to the users.

Two large stainless steel sinks are placed in each classroom for the student to clean up their hands and tools.

Suspended lighting is chosen to give better lighting access. Orange and blue are selected for vocational classrooms and combined with neutral colors.

FIGURE 5.2.33 CERAMIC CLASSROOM

Vocational Classroom

Art Classroom

In the art classroom there will be painting and drawing activities, therefore, easel drawing stands are provided in the room.

Two large stainless steel sinks are placed in each classroom for the student to clean up their hands and tools. Concealed lighting tube is used to give even lighting to the room as there are loose furniture.

FIGURE 5.2.34 ART CLASSROOM

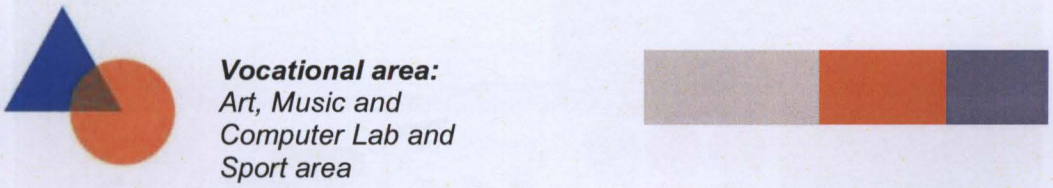


FIGURE 5.2.35 COLOR SELECTION FOR VOCATIONAL CLASSROOMS

Selected Design: Material, Furniture, Lighting Fixture and Color Scheme

FIGURE 5.2.36 MATERIAL BOARD FOR PUBLIC AREA

FIGURE 5.2.37 MATERIAL BOARD FORLEARNING AREA

5.3 Thesis Final Presentation

5.3.1Thesis Final Presentation Board

FIGURE 5.3.1 FINAL PRESENTATION BOARD

5.3.2 Thesis Final Model

In the foyer, the opening voids that connect inside – outside atmosphere as well as a gathering place to the users. The building surrounding can be seen in space model as there are car parking at the left side of the building which leads to both main entrance and loading. At the back of the building is a pond that gives more natural atmosphere to the building.

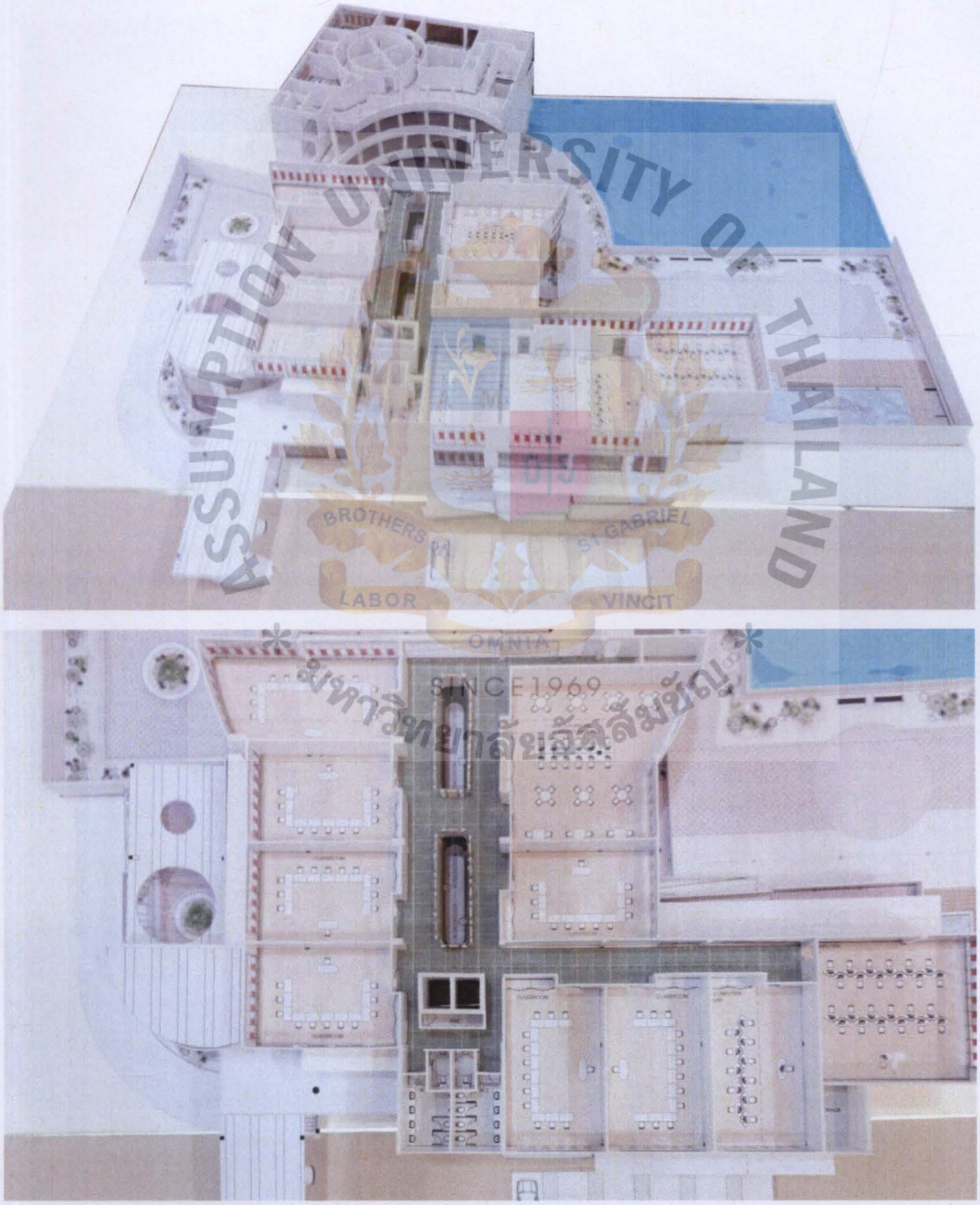


FIGURE 5.3.2 FINAL MODEL

The final model is to show the connection of each space horizontally and vertically and also to show the space and connection of two building with the bridge. The opening void in 2nd to 3rd floor with wooden panel handrail which is 150 cm height to protect the users from falling. The materials used in different floors, windows glazing with different material and colors can be seen in space model.

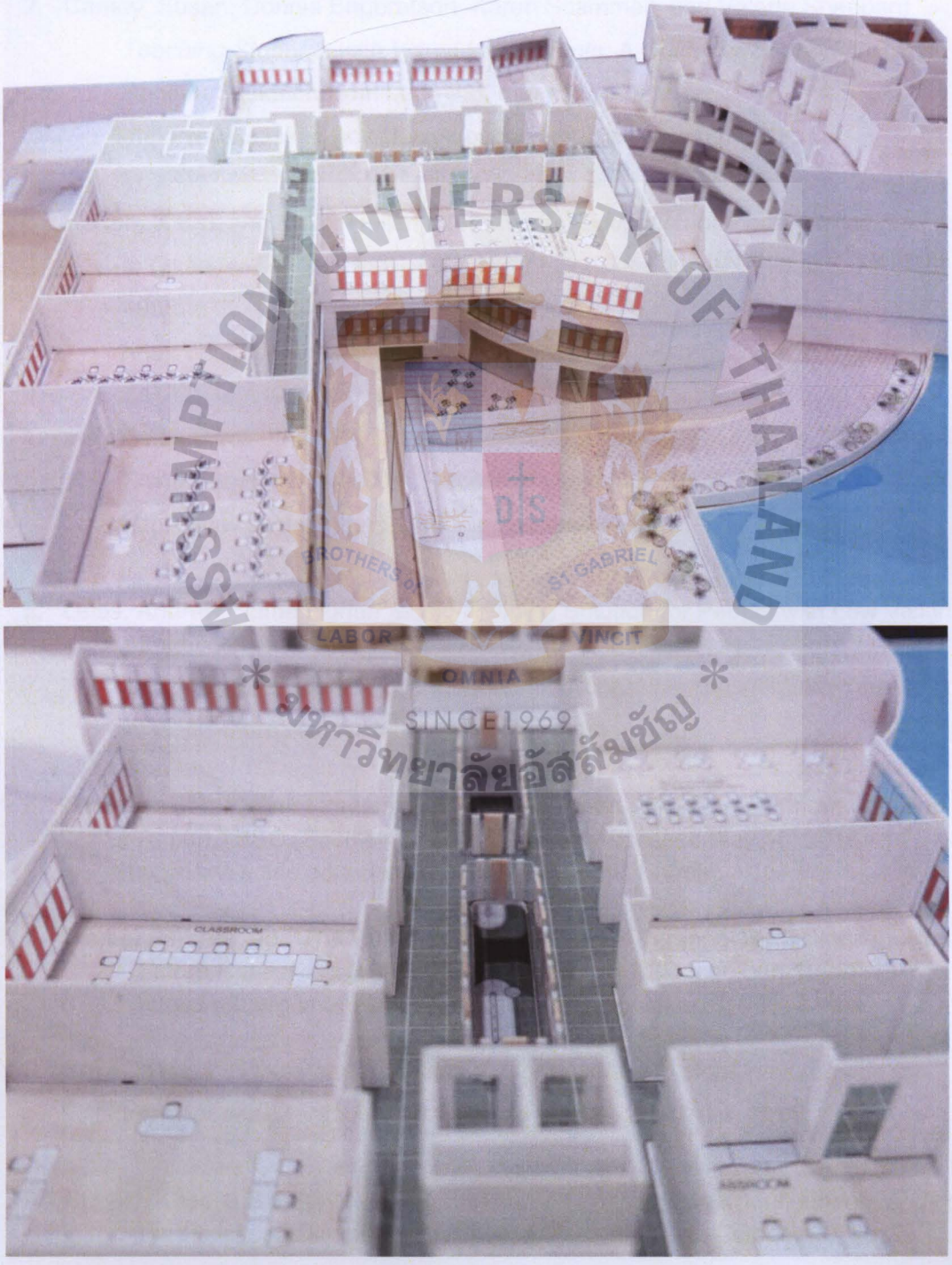


FIGURE 5.3.3 FINAL MODEL

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Appendix

Appendix A

Title: Questionnaire

1

Project: Visual Impairment Children Center

Interior Architecture Design Facility: Assumption University

This questionnaire is a research for the thesis under the topic of Visual Impairment Children Center (Target User: Low Vision and Blind Children from the age of 10-18). This questionnaire is to research about the physical and functional needs of the users.

Part I: General Information คำถามทั่วไป

1.1 Gender เพศ

Male ชาย ☐

Female หญิง ☐

1.2 Age อายุ

Under 15 years old	น้อยกว่า 15	☐
15-20 years old	15 – 20 ปี	☐
20-30 years old	20 -30 ปี	☐
30-40 years old	30 -40 ปี	☐
40-60 years old	40-50 ปี	☐

1.3 Occupation อาชีพ

Student	นักเรียน	☐
Teacher	คุณครู	☐
Parent	ผู้ปกครอง	☐
Staff/ Volunteers	เจ้าหน้าที่ /อาสาสมัคร	☐

1.4 Visual condition สภาพการมองเห็น

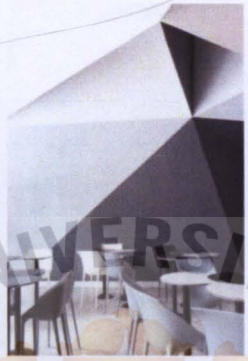
Normal	ปกติ	☐
Low vision	สายตาเลือนราง	☐
Blind	ตาบอด	☐

Part II: Interior Space and Lighting

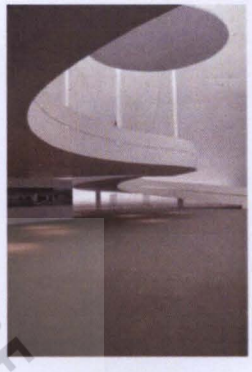
2.1 What kind of form do you prefer to have in the space? คุณต้องการให้อาคารเป็นรูปทรงแบบใด

Simple geometric form
รูปทรงเรขาคณิต ☐

Diagonal form
รูปทรงเฉียง ☐



Curve form
รูปทรงโค้ง ☐



2.2 Please rate the Sensory Support that you think is most effective in orientation for visual impairment?

โปรดทำเครื่องหมายถูกเพื่อให้คะแนนประสาทสัมผัสที่ช่วยนำทางได้อย่างมีประสิทธิภาพของผู้พิการทางสายตา

Sense	Bad แย่	Normal ปกติ	Good ดี	Excellent ดีเยี่ยม
Touch การสัมผัส				
Smell กลิ่น				
Sound เสียง				

2.3 What kind of atmosphere do you prefer to have in the area?

คุณต้องการให้ความรู้สึกแบบไหนภายในอาคา

School โรงเรียน ☐

Home บ้าน ☐

Playground สนามเด็กเล่น ☐

2.4 Do you think that it is good to have outdoor space connected to the indoor space of the school?

คุณคิดว่าดีหรือไม่ที่พื้นที่นอกอาคารเชื่อมกับพื้นที่ภายในอาคารของโรงเรียน

Yes ใช่ ☐

No ไม่ ☐

2.5 Educational System

ระบบการเรียน

Academic Education เรียนที่โรงเรียน ☐

Home School เรียนที่บ้าน ☐

4

2.5 If you think that connected to the outdoor space, can you rate the outdoor area to connect to the interior?

โปรดทำเครื่องหมายถูกเพื่อให้คะแนนพื้นที่ที่เชื่อมต่อภายในและภายนอกอาคาร

Types	Image	Bad แย่	Normal ปกติ	Good ดี	Excellent ดีเยี่ยม
Indoor garden สวนภายในอาคาร					
Vertical garden สวนแนวตั้ง	 				
Semi-outdoor Garden สวนกึ่งภายนอก	 				

5

Part III: Interior design for each area

3.1 Lobby ล็อบบี้

- What kind of color scheme do you prefer for the lobby area?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับล็อบบี้

Light ☐

Bright ☐

- What kind of Sensory Supporting for navigation in the lobby area?
  คุณคิดว่าสัมผัสชนิดใดที่ช่วยนำทางภายในล็อบบี้

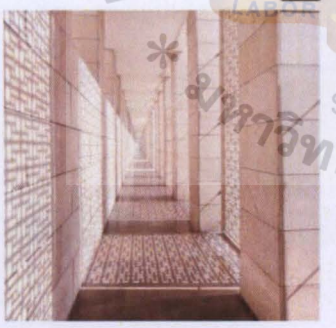
Touch การสัมผัส ☐

Smell ได้กลิ่น ☐

Sound ได้ยิน ☐

- What kind of space/ circulation do you prefer to have in corridor?
  คุณต้องการให้ทางเดินเป็นรูปทรงแบบใด

Linear แนวตรง ☐



Curve โค้ง ☐

6

3.2 Multipurpose area and Library

พื้นที่สำหรับทำกิจกรรมและห้องสมุด

- What kind of color scheme do you prefer for the area?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับพื้นที่นี้

Light ☐ 

Bright ☐ 

- What kind of Sensory Supporting for navigation in the area?
  คุณคิดว่าสัมผัสชนิดใดที่ช่วยนำทางภายในพื้นที่นี้

Touch การสัมผัส ☐

Smell ได้กลิ่น ☐

Sound ได้ยิน ☐

3.3 Dining/ Cafeteria โรงอาหาร

- What kind of color scheme do you prefer for the area?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับพื้นที่นี้

Light ☐ 

Bright ☐ 

7

- What kind of service do you prefer to have in the cafeteria?
  คุณต้องการการบริการแบบใดในโรงอาหาร

Self-service	บริการตนเอง	☐
Service by staff or guided person	บริการโดยพนักงาน	☐
Table service	จัดเตรียมอาหารไว้ให้เรียบร้อยแล้ว	☐

3.4 Classroom ห้องเรียน

- What kind of color scheme do you prefer for the classroom?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับพื้นที่นี้

Light ☐ Bright ☐

- What kind of Sensory Supporting for navigation in the classroom?
  คุณคิดว่าสัมผัสชนิดใดที่ช่วยนำทางภายในพื้นที่นี้

Touch	การสัมผัส	☐
Smell	ได้กลิ่น	☐
Sound	ได้ยิน	☐

- How many students do you prefer to have in a classroom?
  คุณต้องการให้มีนักเรียนภายในห้องกี่คน

5-10 ☐

10-15 ☐

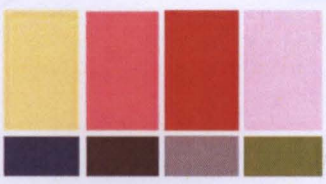
15-20 ☐

3.5 Vocational training (Workshop) ห้องฝึกอาชีพ

- What kind of color scheme do you prefer for the Vocational training (Workshop)?
  คุณคิดว่าโทนสีแบบใดที่เหมาะกับพื้นที่นี้

Light ☐

Bright ☐



- What kind of Sensory Supporting for navigation in the Vocational training (Workshop)?
  คุณคิดว่าสัมผัสชนิดใดที่ช่วยนำทางภายในพื้นที่นี้

Touch การสัมผัส ☐

Smell ได้กลิ่น ☐

Sound ได้ยิน ☐

- How many students do you prefer to have in a workshop?
  คุณต้องการให้มีนักเรียนภายในห้องกี่คน

5-10 ☐

10-15 ☐

15-20 ☐

3.6 Outdoor/ Sport area พื้นที่ภายนอกอาคาร

- What do you prefer to have as a sport for visual impaired students?
  คุณต้องการให้มีกีฬาแบบใดสำหรับนักเรียน

Indoor sport กีฬาในร่ม ☐

Outdoor sport กีฬากลางแจ้ง ☐

- What kind of indoor sport do you prefer for visual impaired students?
  คุณต้องการกีฬาในร่มชนิดใดสำหรับนักเรียน

Physical exercise	พลศึกษา	☐
Yoga	โยคะ	☐
Aerobic	แอโรบิค	☐
Table tennis	ปิงปอง	☐

- What kind of outdoor sport do you prefer for visual impaired students?
  คุณต้องการกีฬากลางแจ้งชนิดใดสำหรับนักเรียน

Swimming	ว่ายน้ำ	☐
Goal ball	โกล์บอล	☐
Football	ฟุตบอล	☐
Running	วิ่งแข่ง	☐

- Do you prefer to have an outdoor area such as garden and playground?
  คุณชอบพื้นที่ภายนอกอาคาร เช่น สวน และ สนามเด็กเล่น หรือไม่

Yes	ใช่	☐
No	ไม่	☐

- Thank You for your time.